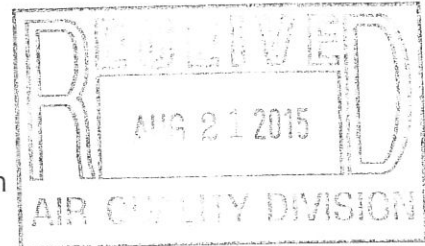




August 20, 2015

Ms. Alicia Boltz
Air Quality Engineer
Wyoming Dept. of Environmental Quality – Air Quality Division
122 W. 25th Street
Cheyenne, WY 82002



**Re: Response to Incompleteness Letter
Application A0000942 Stud Horse Butte 13-26 Central Facility
Jonah Energy LLC**

Dear Ms. Boltz,

Under cover dated April 29, 2015, Jonah Energy LLC (Jonah) submitted a Chapter 6, Section 2 air quality permit application to the Wyoming Department of Environmental Quality - Air Quality Division (WDEQ) for the request to install and operate one (1) natural gas-fired compressor engine with a maximum horsepower (hp) of 1,850 hp and two (2) 1.0 MMBtu/hr separator heaters. The WDEQ confirmed receipt of the permit application on May 6, 2015, and assigned Application Number A0000942 to the Stud Horse Butte 13-26 (SHB 13-26) compressor engine application.

On May 18, 2015, the WDEQ issued an Incomplete Application determination on the SHB 13-26 compressor engine application, requesting additional release point information be provided on the IMPACT application forms, along with the request to submit AERMOD modeling for the project.

Since the receipt of the May 18, 2015 letter from the WDEQ, Jonah has finalized the line pressure reduction project compression requirements at the SHB 13-26 production facility, resulting in the requirement to install two (2) compressor engines instead of one (1) compressor engine.

Therefore, on behalf of Jonah, SLR International Corporation (SLR) is pleased to provide the attached AERMOD dispersion modeling, updated emissions calculations, and IMPACT application forms in response to the incompleteness determination dated May 18, 2015 for Jonah's Stud Horse Butte 13-26 (SHB 13-26) Central Facility.

August 20, 2015
Ms. Alicia Boltz
SHB 13-26 Application No. A0000942
Page 2

SLR conducted the AERMOD dispersion modeling in accordance with our discussions with Mr. Nathan Henschel and Mr. Josh Nall and following applicable WDEQ minor source modeling guidance. A description of the modeling inputs, methodology and results is provided in **Attachment A**. Detailed emissions calculations for the compressor engines and heaters along with vendor sheets are provided as **Attachment B**. The applicable IMPACT application forms are provided as **Attachment C** and **Attachment D** contains the electronic modeling input/output files along with a pdf version of this letter response and associated attachments.

We are assuming that you will make sure the modeling I/O files and supporting information are provided to Mr. Nathan Henschel for his review. If you have any questions regarding the emissions calculations and/or IMPACT forms please do not hesitate to contact Chuck Cornell of Jonah at (720) 577-1251 or me at (970) 999-3969. Any questions regarding the modeling please have Mr. Henschel contact Jason Reed of SLR at (970) 999-3970.

We trust this information will be sufficient for the Division to deem the permit application complete, and we thank you in advance for your prompt review of this most important application.

Sincerely,
SLR International Corporation



Jamie Christopher
Principal Engineer
jchristopher@slrconsulting.com

JC/
Enc.



ATTACHMENT A - Modeling Methodology and Results

MODELING METHODOLOGY AND INPUTS

SLR conducted air dispersion modeling for the proposed modification of the SHB 13-26 central facility using the latest version of the AERMOD modeling system including:

- AERMAP version 11103;
- AERSURFACE version 13016;
- AERMET version 15181; and
- AERMOD version 15181.

The meteorological data used in the analysis was the 2010-2014 Juel Spring surface meteorological data and Riverton upper air data¹. The Juel Spring data include horizontal wind speed and direction, ambient temperature, 10-2 meter temperature difference, and total solar radiation. Horizontal wind direction standard deviation (sigma-theta) is also calculated at the Juel Spring site; however, based on direction received from the WDEQ², the sigma-theta data were not used.

The 2011 National Land Cover Dataset (NLCD) was used to obtain geophysical parameters, in twelve 30° sectors, for the area centered around the Juel Spring tower location. The selection of seasons for each month was based on WDEQ guidance^{3,4}, which assumes default seasons except for winter in which an analysis of snow cover was conducted. If a month had greater than 50% of the days with a snow depth of more than 1", it was classified as winter with snow; otherwise it was classified as winter with no snow. The snow cover and precipitation data from the nearby Boulder Rearing Station was used to perform this classification as well as the moisture levels of dry, average or wet based on EPA guidance⁵.

Receptors were generated following the WDEQ guidance and elevations were obtained using AERMAP and elevation data from the National Elevation Dataset (NED). All preprocessing files for AERSURFACE, AERMET and AERMAP are provided in the attached CD (**Attachment D**).

¹ The Juel Spring surface data was provided by WDEQ to SLR by email on May 20, 2015. The upper air data was obtained from the NOAA FSL database: <http://esrl.noaa.gov/raobs/>.

² E-mail from Josh Nall on July 20, 2015 recommending that Juel Spring sigma-theta data not be used in the AERMET processing.

³ WDEQ-AQD Minor Source Modeling Guidance, September 2014.

⁴ This was provided by WDEQ to SLR by email on May 20, 2015.

⁵ AERSURFACE User's Guide Revised 01/16/2013. Each month's precipitation (2010-2014) was compared to the period of record average monthly precipitation to determine if that month was dry, average or wet.

AERMOD MODELING AND RESULTS

Dispersion modeling for SHB 13-26 was performed for annual NO₂ and formaldehyde impacts following discussions with WDEQ. The model was run in default mode to determine the maximum annual impacts for each year in the five-year modeling period. The ambient ratio method (75% conversion of modeled NO_x-to-NO₂) was applied to the maximum annual NO_x concentrations for comparison to the Wyoming Ambient Air Quality Standards (WAAQS) and Class II increment. The emissions and stack parameters for the two (2) compressor engines and two (2) heaters are provided in **Attachment B**. The compressor engine stack heights are sufficient to meet the WDEQ minor source modeling requirement that the engine stack heights must be at least 1.5 x higher than the compressor building height. In this case, the engine stack heights are 1.5 x 17.5'; or 26.25' above ground level.

Due to the close proximity (approximately 3.5 km) from another proposed Jonah Energy project (SHB 1-29), both SHB 13-26 and 1-29 were included in the modeling to address potential source overlap. In addition, WDEQ provided an off-site inventory for NO₂ and formaldehyde to assess cumulative impacts⁶. The offsite inventories were used as-provided with the exception of the modification of some sources with zero base elevations, one source with incorrect coordinates and the removal of an emergency generator per WDEQ's request⁷.

The modeling results for NO_x and formaldehyde are summarized below in **Tables 1 and 2**, respectively. The modeling demonstrates that the maximum SHB 13-26 impacts are above the Class II NO₂ significant impact level, but are only 15% of the annual NO₂ WAAQS and 51% of the Class II NO₂ increment. The results also demonstrate that there is little overlap between impacts from SHB 13-26 and any other nearby sources including SHB 1-29. The SHB 13-26 maximum formaldehyde cancer risk at any receptor is calculated to be 9 per million using the conservative WDEQ methodology⁸. The cumulative formaldehyde cancer risk is calculated to be 9.1 per million, which indicates very little overlap between impacts from SHB13-26 and other nearby sources including SHB 1-29. The AERMOD input and output files for both NO_x and formaldehyde are provided in the CD included as **Attachment D**.

⁶ The offsite inventories were provided by WDEQ to SLR by email on May 20, 2015.

⁷ Email communication between Nathan Henschel (WDEQ) and Jason Reed (SLR).

⁸ WDEQ-AQD Minor Source Modeling Guidance, September 2014.

Table 1: SHB 13-26 Annual NOx Modeling Results

Pollutant	Averaging Period ¹	Sources	Maximum Impact Location				Maximum Predicted Impact ² ($\mu\text{g}/\text{m}^3$)	Background NO ₂ ³ ($\mu\text{g}/\text{m}^3$)	Class II SIL ($\mu\text{g}/\text{m}^3$)	WAAQS ($\mu\text{g}/\text{m}^3$)	Class II Increment ($\mu\text{g}/\text{m}^3$)	Percent of Standard
			UTM X (m)	UTM Y (m)	Elevation (m)	Year						
NO ₂	Annual	SHB 13-26	607500	4700350	2207	2014	16.90	-	1	-	-	> SIL
							12.68	-	-	-	25	51%
NO ₂	Annual	SHB 13-26 and SHB 1-29	607500	4700350	2207	2014	-	2	-	100	-	15%
							12.71	-	-	-	25	51%
NO ₂	Annual	SHB 13-26, SHB 1-29 and offsite	607500	4700350	2207	2014	-	2	-	100	-	15%
							12.94	-	-	-	25	52%
								2	-	100	-	15%

¹ Highest-first-high concentration over all years modeled.

² ARM value of 0.75 applied to modeled impact for comparison to the WAAQS and increment; 100% conversion to NO₂ assumed for comparison to the SIL.

³ Background value of 1 ppb provided by WDEQ on May 20, 2015.

Table 2: SHB 13-26 Annual Formaldehyde Modeling Results

Pollutant	Sources	Averaging Period	Maximum Impact Location				Maximum Predicted Impact (µg/m³)	Cancer Risk ^{2,3} (per million)
			UTM X (m)	UTM Y (m)	Elevation (m)			
					Year			
Formaldehyde	SHB 13-26	Annual ¹	607500	4700350	2207	2014	1.62	9.0
Formaldehyde	SHB 13-26 and SHB 1-29	Annual ¹	607500	4700350	2207	2014	1.62	9.0
Formaldehyde	SHB 13-26, SHB 1-29 and offsite	Annual ¹	607500	4700350	2207	2014	1.64	9.1

¹ Highest-first-high concentration over all years modeled.

² Formaldehyde cancer chronic inhalation factor = $1.30\text{E-}05 \text{ (}\mu\text{g}/\text{m}^3\text{)}^{-1}$ from <http://www2.epa.gov/sites/production/files/2014-05/documents/table1.pdf>.

³ The cancer risk is calculated by: $1.30\text{E-}05 \times \text{modeled concentration} \times 10^6 \times (30/70)$ where 30 represents the life of project.



ATTACHMENT B - Emissions Calculations and Supporting Documentation

Jonah Energy , LLC - SHB 13-28 Compressor Station
Modeling Parameters and Emission Rates per Source

ID		NO _x		Formaldehyde		Direction	Capped?	Height Above Grade		Diameter		Flow		Velocity		Temperature		Easting	Northing
		short-term	Annual	short-term	Annual														
1	Cat G3516TA Gas Compressor #1	0.1429 g/s	0.1429 g/s	0.0143 g/s	0.0143 g/s	Vertical	No	26.25 ft	8.00 m	0.83 ft	0.25 m	3,088 acfm	1.46 cubic m/s	94.35 ft/sec	28.76 m/sec	912 F	489 C	607486.5	4700387.2
2	Cat G3516TA Gas Compressor #2	0.1429 g/s	0.1429 g/s	0.0143 g/s	0.0143 g/s	Vertical	No	26.25 ft	8.00 m	0.83 ft	0.25 m	3,088 acfm	1.46 cubic m/s	94.35 ft/sec	28.76 m/sec	912 F	489 C	607490.8	4700388.7
3	Separator Heater #1	0.0113 g/s	0.0113 g/s	0.00001 g/s	0.00001 g/s	Vertical	No	12.00 ft	3.66 m	0.50 ft	0.15 m	647 acfm	0.31 cubic m/s	54.89 ft/sec	16.73 m/sec	601 F	316 C	607511.4	4700408.0
4	Separator Heater #2	0.0113 g/s	0.0113 g/s	0.00001 g/s	0.00001 g/s	Vertical	No	12.00 ft	3.66 m	0.50 ft	0.15 m	647 acfm	0.31 cubic m/s	54.89 ft/sec	16.73 m/sec	601 F	316 C	607512.7	4700408.0

Table A-1 *Jonah Energy , LLC - SHB 13-26 Compressor Station*
Estimated Potential Uncontrolled Emissions per Source

ID	Emission Unit	Annual Emission Rate - Uncontrolled						Total HAP
		NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}	
1	Cat G3516TA Gas Compressor #1	111.29 tpy	130.17 tpy	6.96 tpy	0.49 tpy	0.75 tpy	0.75 tpy	0.95 tpy
2	Cat G3516TA Gas Compressor #2	111.29 tpy	130.17 tpy	6.96 tpy	0.49 tpy	0.75 tpy	0.75 tpy	0.95 tpy
3	Separator Heater #1	0.39 tpy	0.33 tpy	0.02 tpy	0.00 tpy	0.03 tpy	0.03 tpy	0.007 tpy
4	Separator Heater #2	0.39 tpy	0.33 tpy	0.02 tpy	0.00 tpy	0.03 tpy	0.03 tpy	0.007 tpy
Totals		223.4 tpy	261.0 tpy	14.0 tpy	1.0 tpy	1.6 tpy	1.6 tpy	1.9 tpy

Table A-1a *Jonah Energy , LLC - SHB 13-26 Compressor Station*
Estimated Potential Controlled Emissions per Source

ID	Emission Unit	Annual Emission Rate - Uncontrolled						Total HAP
		NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}	
1	Cat G3516TA Gas Compressor #1	4.97 tpy	14.90 tpy	4.97 tpy	0.49 tpy	0.75 tpy	0.75 tpy	0.82 tpy
2	Cat G3516TA Gas Compressor #2	4.97 tpy	14.90 tpy	4.97 tpy	0.49 tpy	0.75 tpy	0.75 tpy	0.82 tpy
3	Separator Heater #1	0.39 tpy	0.33 tpy	0.02 tpy	0.00 tpy	0.03 tpy	0.03 tpy	0.007 tpy
4	Separator Heater #2	0.39 tpy	0.33 tpy	0.02 tpy	0.00 tpy	0.03 tpy	0.03 tpy	0.007 tpy
Totals		10.7 tpy	30.5 tpy	10.0 tpy	1.0 tpy	1.6 tpy	1.6 tpy	1.7 tpy

Table A-2 Jonah Energy, LLC - SHB 13-26 Compressor Station
Gas Compression IC Engine Criteria Pollutant Emissions Calculations

Engine Data			
IC Engine Make	Caterpillar	Fuel LHV	1,011 Btu/scf
IC Engine Model	G3516TA (4SRB)	Fuel HHV	1,119 Btu/scf
Sulfur Content of Fuel	0.0500 gr/scf	Number of Engines	2
Hours per Year	8,760 hr/yr		

Load	100% Max ¹	75% Load	50%
Power Rating	1,029 bhp	772 bhp	515 bhp
Specific Fuel Consumption	LHV		
	7,700 Btu/bhp-hr	8,080 Btu/bhp-hr	9,196 Btu/bhp-hr
Fuel Consumption (LHV)	7,836.1 scf/hr	6,171.1 scf/hr	4,679.3 scf/hr
Fuel Consumption (LHV)	68.6 MMscf/yr	54.1 MMscf/yr	41.0 MMscf/yr
Duty (input) - HHV	8.77 MMBtu/hr	6.90 MMBtu/hr	5.24 MMBtu/hr
Duty (input) - LHV	7.92 MMBtu/hr	6.24 MMBtu/hr	4.73 MMBtu/hr
Exhaust Stack Temp	912 F	855 F	786 F
Exhaust Gas Flow	3,088 acfm	2,271 acfm	1,511 acfm

Pollutant	Emission Factors @ Loads			Add-On Control & Efficiency	Source
	100% Load	75% Load	50%		
NO _x	11.20 g/bhp-hr	12.10 g/bhp-hr	11.10 g/bhp-hr	NSCR	0.5 b/bhp-hr WDEQ BACT
CO	13.10 g/bhp-hr	10.20 g/bhp-hr	16.20 g/bhp-hr	NSCR	1.5 g/bhp-hr WDEQ BACT
NMHC	0.70 g/bhp-hr	0.70 g/bhp-hr	0.70 g/bhp-hr	NSCR	0.5 b/bhp-hr WDEQ BACT
SO ₂	0.01276 lb/MMBtu	0.012756 lb/MMBtu	0.012756 lb/MMBtu	None	AP42 Tbl 3.2-2
PM ₁₀	0.019410 lb/MMBtu	0.019410 lb/MMBtu	0.019410 lb/MMBtu	None	AP42 Tbl 3.2-2
PM _{2.5}	0.019410 lb/MMBtu	0.019410 lb/MMBtu	0.019410 lb/MMBtu	None	AP42 Tbl 3.2-2
HCHO	0.05 g/bhp-hr	0.05 g/bhp-hr	0.05 g/bhp-hr	NSCR	0.05 g/bhp-hr WDEQ BACT
CO ₂	53.02000 kg/MMBtu	53.02000 kg/MMBtu	53.02000 kg/MMBtu	None	Part 98, Subpart C
CH ₄	1.61 g/bhp-hr	1.53 g/bhp-hr	2.12 g/bhp-hr	None	Manufacturer
N ₂ O	0.00010 kg/MMBtu	0.00010 kg/MMBtu	0.00010 kg/MMBtu	None	Part 98, Subpart C

One Cat G3516TA Engine - Controlled Emission Rates - All Loads												
Pollutant	100%		75% Load		50%		100%		75% Load		50%	
	lb/hr	g/s	lb/hr	g/s	lb/hr	g/s	TPY	g/s	TPY	g/s	TPY	g/s
NO _x	1.13	0.1429	0.92	0.1159	0.56	0.0708	4.97	0.1429	4.03	0.1159	2.46	0.0708
CO	3.40	0.4288	1.99	0.2505	2.10	0.2651	14.90	0.4288	8.71	0.2505	9.22	0.2651
NMHC	1.13	0.1429	0.85	0.1073	0.57	0.0715	4.97	0.1429	3.73	0.1073	2.48	0.0715
SO ₂	0.112	0.0141	0.0881	0.0111	0.0668	0.0084	0.49	0.0141	0.39	0.0111	0.29	0.0084
PM ₁₀	0.17	0.0214	0.13	0.0169	0.10	0.0128	0.75	0.0214	0.59	0.0169	0.45	0.0128
PM _{2.5}	0.170	0.0214	0.134	0.0169	0.102	0.0128	0.745	0.0214	0.587	0.0169	0.445	0.0128
HCHO	0.11	0.0143	0.09	0.0107	0.06	0.0071	0.50	0.0143	0.37	0.0107	0.25	0.0071
CO ₂	1,024.79	129.12	807.04	101.68	611.95	77.10	4,488.6	129.12	3,534.8	101.68	2,680.3	77.10
CH ₄	2.61	0.3287	1.86	0.2344	1.72	0.2164	11.43	0.3287	8.15	0.2344	7.52	0.2164
N ₂ O	0.002	0.0002	0.002	0.0002	0.001	0.0001	0.008	0.0002	0.007	0.0002	0.005	0.0001

Emissions Summary - Worst Case Full Load (100%)								
Pollutant	One (1) Cat G3516TA - 100%				2 Cat 3516TA - 100%			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
NO _x	25.41	111.29	1.13	4.97	50.82	222.57	2.27	9.94
CO	29.72	130.17	3.40	14.90	59.44	260.33	6.81	29.81
NMNEHC	1.59	6.96	1.13	4.97	3.18	13.91	2.27	9.94
SO ₂	0.11	0.49	0.11	0.49	0.22	0.98	0.22	0.98
PM ₁₀	0.17	0.75	0.17	0.75	0.34	1.49	0.34	1.49
PM _{2.5}	0.170	0.745	0.170	0.745	0.340	1.491	0.340	1.491
HCHO	0.11	0.50	0.11	0.50	0.23	0.99	0.23	0.99
CO ₂	120.3	526.8	120.3	526.8	240.6	1,053.6	240.6	1,053.6
CH ₄	3.65	16.00	2.61	11.43	7.30	31.99	5.22	22.85
N ₂ O	0.002	0.008	0.002	0.008	0.004	0.017	0.004	0.017
CO ₂ e	865.4 tpy		769.4 tpy		1,730.8 tpy		1,538.8 tpy	

Sample Calcs:

$(\text{bhp}) (\text{Btu/bhp-hr}) (\text{MM}/10^6) = \text{MMBtu/hr}; \quad (\text{MMBtu/hr}) / (\text{Btu/scf}) (10^6/\text{MM}) = \text{scf/hr}$
 $(\text{g/bhp-hr}) (\text{bhp}) (\text{lb}/453.59 \text{ g}) = \text{lb/hr}; \quad (\text{lb/MMBtu}) (\text{MMBtu/hr}) = \text{lb/hr}; \quad (\text{kg/MMBtu}) (\text{MMBtu/hr}) (2.2046 \text{ lb/kg}) = \text{lb/hr}$
 $(\text{lb/hr}) (\text{hrs/yr}) (\text{ton}/2000 \text{ lb}) = \text{tons/yr}$
 $(\text{lb/hr}) (453.59 \text{ g/lb}) (\text{hr}/60 \text{ min}) (\text{min}/60 \text{ sec}) = \text{g/sec}; \quad (\text{ton/yr}) (2,000 \text{ lb/ton}) (453.59 \text{ g/lb}) (8760 \text{ hr/yr}) (\text{hr}/60 \text{ min}) (\text{min}/60 \text{ sec}) = \text{g/sec}$

Notes:

Hp, fuel consumption & uncontrolled emission factors for NO_x, CO, NMHC from Caterpillar specific technical data sheet, Ref. Data Set DM5172-02, printed 01Feb-99.
 1,050 hp 100% load rating * 0.98 de-rate factor @ 7,000 ft and 50°F inlet temp. Same for 788 hp (75% load) & 525 hp (50% load)
 Exhaust flow adjusted for 7,000 ft elevation or 11.5 psia
 Controlled emissions for NO_x, CO, VOC, & HCHO are based on proposed WDEQ BACT limits (0.5, 1.0, 0.7, & 0.05 g/bhp-hr)
 SO₂ emissions based on sulfur content of gas (5 grains S/100 scf and 100% conversion).
 Emission factor for PM₁₀ and PM_{2.5} from EPA, AP-42 Chapter 3.2, Table 3.2-3, including PM₁₀ and PM_{2.5} filterable plus PM condensable.

Table A-2a

Jonah Energy, LLC - SHB 13-26 Compressor Station
Gas Compression IC Engine HAP Emissions Calculations

Pollutant	Emission Factor ¹	Uncontrolled Emission Rates		Controlled Emission Rates			2 Engines	
		One Engine		One Engine				
		(lb/hr) ²	(lbs/yr) ³	(lb/hr) ²	(lbs/yr) ³	(tpy) ⁴	(lb/hr)	(tpy)
1,1,2,2-Tetrachloroethane	2.53E-05 lb/MMBtu	0.0002	1.94	0.0002	1.39	0.0007	0.0003	0.0014
1,1,2-Trichloroethane	1.53E-05 lb/MMBtu	0.0001	1.18	0.0001	0.84	0.0004	0.0002	0.0008
1,3-Butadiene	6.63E-04 lb/MMBtu	0.0058	50.92	0.0042	36.37	0.0182	0.0083	0.0364
1,3-Dichloropropene	1.27E-05 lb/MMBtu	0.0001	0.98	0.0001	0.70	0.0003	0.0002	0.0007
Acetaldehyde	2.79E-03 lb/MMBtu	0.0245	214.28	0.0175	153.05	0.0765	0.0349	0.1531
Acrolein	2.63E-03 lb/MMBtu	0.0231	201.99	0.0165	144.28	0.0721	0.0329	0.1443
Benzene	1.58E-03 lb/MMBtu	0.0139	121.35	0.0099	86.68	0.0433	0.0198	0.0867
Carbon Tetrachloride	1.77E-05 lb/MMBtu	0.0002	1.36	0.0001	0.97	0.0005	0.0002	0.0010
Chlorobenzene	1.29E-05 lb/MMBtu	0.0001	0.99	0.0001	0.71	0.0004	0.00	0.00
Chloroform	1.37E-05 lb/MMBtu	0.0001	1.05	0.0001	0.75	0.0004	0.00	0.00
Ethylbenzene	2.48E-05 lb/MMBtu	0.0002	1.90	0.0002	1.36	0.0007	0.0003	0.0014
Formaldehyde ⁴	0.05 g/bhp-hr	0.1134	993.6330	0.1134	993.63	0.50	0.23	0.99
Methanol	3.06E-03 lb/MMBtu	0.0268	235.01	0.0192	167.87	0.0839	0.0383	0.1679
Methylene Chloride	4.12E-05 lb/MMBtu	0.0004	3.16	0.0003	2.26	0.0011	0.0005	0.0023
Naphthalene	9.71E-05 lb/MMBtu	0.0009	7.46	0.0006	5.33	0.0027	0.0012	0.0053
PAH	1.41E-04 lb/MMBtu	0.0012	10.83	0.0009	7.74	0.0039	0.0018	0.0077
Styrene	1.19E-05 lb/MMBtu	0.0001	0.91	0.0001	0.65	0.0003	0.0001	0.0007
Toluene	5.58E-04 lb/MMBtu	0.0049	42.86	0.0035	30.61	0.0153	0.0070	0.0306
Vinyl Chloride	7.18E-06 lb/MMBtu	0.0001	0.55	0.0000	0.39	0.0002	0.0001	0.0004
Xylene	1.95E-04 lb/MMBtu	0.0017	14.98	0.0012	10.70	0.0053	0.0024	0.0107
		Totals		0.19	1,646.3	0.82	0.38	1.65
		Maximum Individual HAP (HCHO)				0.50	0.99	

Make	Caterpillar		
Model	G3516TA (4SRB)		
Number of IC Engines	2	Heat Input (LHV) ⁵	7.92 MMBtu/hr
Hours of Operation	8,760 hr/yr	Heat Input (HHV) ⁶	8.77 MMBtu/hr
Horsepower	1,029 bhp	Catalyst CE for HAPs ⁷	29%
Specific Fuel Consumption	7,700 Btu/bhp-hr	Catalyst CE for HCHO ⁷	0.05 g/bhp-hr

Notes:

¹ Emission factors from AP-42, Section 3.2, Table 3.2-3 (7/00) - 4-stroke rich-burn (4SRB) engines

² (MMBtu/hr [HHV]) (lb/MMBtu) = lb/hr; (lb/hr) (100 - % control) / 100 = lb/hr

³ (b/hr) (8760 hr/yr) / (2,000 lb/ton) = tpy; (tpy) (100 - % control) / 100 = tpy

⁴ Formaldehyde emission factor based on WDEQ BACT for 4SRB engine.

⁵ LHV heat input rate for the engine is based on LHV fuel consumption rate for one engine from manufacturer spec sheet.

[LHV Btu/bhp-hr] * [bhp] / 1,000,000 = MMBtu/hr

⁶ AP-42 EFs are based on HHV, therefore, Heat Input for HHV was used.

[HHV Btu/bhp-hr] * [bhp] / 1,000,000 = MMBtu/hr

⁷ Catalyst control efficiency based on manufacturer-specified percent reduction

Table A-3 Jonah Energy, LLC - SHB 13-26 Compressor Station
Natural Gas-Fired Heater Treater Criteria Pollutant Emissions Calculations

Emission Source:	Separator Heater
Source Type:	Natural Gas-Fired Heater
Heat Input:	1.00 MMBtu/hr
Natural Gas Higher Heating Value (HHV):	1,119 Btu/scf
Fuel Consumption (HHV):	0.0009 MMscf/hr
Fuel Consumption (HHV):	7.83 MMscf/yr
Operating Hours per Year:	8,760 hr/yr
Sulfur Content of Fuel:	0.0500 gr/scf
Exhaust Stack Temp:	601 F
Exhaust Gas Flow:	647 acfm
Number of Units:	2

Pollutant	Emission Factors ¹	One Heater			
		Short-term		Annual	
		lb/hr ²	g/sec	tpy ³	g/sec
NO _x	100.0 lb/MMscf	0.09	0.0113	0.39	0.0113
CO	84.0 lb/MMscf	0.08	0.0095	0.33	0.0095
VOC	5.5 lb/MMscf	0.005	0.0006	0.02	0.0006
SO ₂	0.013 lb/MMBtu	0.00001	0.0000	0.00005	0.0000
PM ₁₀	7.6 lb/MMscf	0.01	0.0009	0.03	0.0009
PM _{2.5}	7.6 lb/MMscf	0.01	0.0009	0.03	0.0009
CO ₂	53.02 kg/MMBtu	116.9	14.73	512.0	14.73
CH ₄	0.001 kg/MMBtu	0.002	0.0003	0.010	0.0003
N ₂ O	0.0001 kg/MMBtu	0.000	0.0000	0.001	0.0000
CO ₂ e				512.5 tpy	

Notes:

¹ Emission factors (lb/MMscf) based on USEPA AP-42, Section 1.4, Table 1.4-2, dated July 1998

AP42 Tble 1.4-2 indicates that all PM (total, condensible, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM_{2.5} or PM₁ emissions.

² Hourly Emission Rate (lb/hr) = (lb/MMscf) * (MMscf/hr); or (kg/MMBtu) (MMBtu/hr) (2.2046 lb/kg)

³ Annual Emission Rate (tpy) = (lb/hr) (hrs/yr) (ton/2000 lb)

Table A-3a

Jonah Energy , LLC - SHB 13-26 Compressor Station
Natural Gas-Fired Heater Treater HAP Emissions Calculations

Pollutant	Type ¹	Emission Factor (lb/MMscf) ²	Emission Rates		
			One Heater		
			(lb/hr) ³	(lbs/yr)	(tpy) ⁴
2-Methylnaphthalene	HAP	2.4E-05	2.15E-08	1.88E-04	9.40E-08
3-Methylchloranthrene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
7,12-Dimethylbenz(a)anthracene	HAP	1.6E-05	1.43E-08	1.25E-04	6.26E-08
Acenaphthene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Acenaphthylene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Anthracene	HAP	2.4E-06	2.15E-09	1.88E-05	9.40E-09
Benz(a)anthracene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Benzene	HAP	2.1E-03	1.88E-06	1.64E-02	8.22E-06
Benzo(a)pyrene	HAP	1.2E-06	1.07E-09	9.40E-06	4.70E-09
Benzo(b)fluoranthene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Benzo(g,h,i)perylene	HAP	1.2E-06	1.07E-09	9.40E-06	4.70E-09
Benzo(k)fluoranthene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Chrysene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Dibenzo(a,h)anthracene	HAP	1.2E-06	1.07E-09	9.40E-06	4.70E-09
Dichlorobenzene	HAP	1.2E-03	1.07E-06	9.40E-03	4.70E-06
Fluoranthene	HAP	3.0E-06	2.68E-09	2.35E-05	1.17E-08
Fluorene	HAP	2.8E-06	2.50E-09	2.19E-05	1.10E-08
Formaldehyde	HAP	7.5E-02	6.70E-05	5.87E-01	2.94E-04
n-Hexane	HAP	1.8E+00	1.61E-03	1.41E+01	7.05E-03
Indeno(1,2,3-cd)pyrene	HAP	1.8E-06	1.61E-09	1.41E-05	7.05E-09
Naphthalene	HAP	6.1E-04	5.45E-07	4.78E-03	2.39E-06
Phenanthrene	HAP	1.7E-05	1.52E-08	1.33E-04	6.66E-08
Pyrene	HAP	5.0E-06	4.47E-09	3.91E-05	1.96E-08
Toluene	HAP	3.4E-03	3.04E-06	2.66E-02	1.33E-05
					7.37E-03

Natural Gas-Fired Heater 8,760 hr/yr
Maximum Heat Input 1.00 MMBtu/hr
Natural Gas Heating Value 1,119 Btu/scf
Fuel Consumption (LHV) 0.0009 MMscf/hr
Fuel Consumption (LHV) 7.83 MMscf/yr
Number of Heaters 2

Total HAPs 0.007 tpy
Max HAP 0.007 tpy

Notes:

- ¹ Type = HAP for Hazardous Air Pollutant.
- ² Emission factors from AP-42, Section 1.4, Table 1.4-3 (7/98).
- ³ Hourly Emission Rate (lb/hr) = [(MMBtu/Hr) * (lb/MMscf)] / [(BTU/scf)]
- ⁴ Annual Emission Rate (tpy) = (lb/hr) * (8760 hr/yr) / (2,000 lb/ton)

G3516 TA**GAS ENGINE TECHNICAL DATA****CATERPILLAR®**

ENGINE SPEED:	1200	FUEL:	NAT GAS
COMPRESSION RATIO:	9.0:1	FUEL SYSTEM:	HPG IMPCO
AFTERCOOLER (°F)	130	WITH AIR FUEL RATIO CONTROL	
JACKET WATER (°F)	210	MIN. FUEL PRESS. (PSIG):	25
COOLING SYSTEM:	COMBINED	MIN. METHANE NUMBER:	80
IGNITION SYSTEM:	EIS	RATED ALTITUDE (FT):	5000
EXHAUST MANIFOLD:	WET	AT AMBIENT TEMP (°F):	77
COMBUSTION:	STOICH	NOx EMISSION LEVEL:	CATALYST
		PRICE LIST SETTING:	PA-4880

RATING AND EFFICIENCY	NOTES	LOAD	100%	75%	50%
LHV OF FUEL		BTU/SCF	920	920	920
ENGINE POWER		BHP	1050	788	525
ENGINE EFFICIENCY	(1)	%	33.1	31.5	27.7
THERMAL EFFICIENCY	(6)	%	54.6	56.5	61.0
TOTAL EFFICIENCY	(7)	%	87.7	88.1	88.7

ENGINE DATA					
FUEL CONSUMPTION	(1)	BTU/bhp-hr	7700	8080	9196
AIR FLOW (77 °F, 14.7 psi)	(WET)	SCFM	1365	1046	732
AIR FLOW	(WET)	lb/hr	6054	4639	3246
COMPRESSOR OUT PRESS.		in. HG (abs)	60.9	58	52.4
COMPRESSOR OUT TEMP.		°F	257	238	209
INLET MAN. PRESS.		in. HG (abs)	54.5	46	38.5
INLET MAN. TEMP.	(11)	°F	133	133	131
TIMING	(12)	°BTDC	23	23	23
NOISE - MECH @ 1m		dB(A)	100	99	98
NOISE - EXH @ 1.5m		dB(A)	111	110	109
EXHAUST STACK TEMP.		°F	912	855	786
EXHAUST GAS FLOW (@ stack temp.)	(WET)	CFM, 14.5 psi	3893	2863	1905
EXHAUST MASS	(WET)	lb/hr	6449	4951	3476

EMISSIONS DATA					
NOx (as NO2)	(10)	g/bhp-hr	11.2	12.1	11.1
CO	(10)	g/bhp-hr	13.1	10.2	16.2
THC	(10)	g/bhp-hr	1.9	1.8	2.5
NMHC	(10)	g/bhp-hr	0.29	0.27	0.38
EXHAUST O2	(10)	%	0.3	0.2	0.2
LAMBDA			1.01	1.02	1.01

HEAT BALANCE DATA					
LHV INPUT	(1)	BTU/min	134750	106052	80463
HEAT REJ. TO JACKET	(2) (8)	BTU/min	48958	41715	36270
HEAT REJ. TO ATMOSPHERE	(4)	BTU/min	4554	3795	3037
HEAT REJ. TO LUBE OIL	(5)	BTU/min	7731	6588	5728
HEAT REJ. TO EXH. (LHV to 77°F)	(2)	BTU/min	25989	18587	12129
HEAT REJ. TO EXH. (LHV to 350°F)	(2)	BTU/min	16938	11665	7086
HEAT REJ. TO A/C	(3) (9)	BTU/min	2968	1955	1025

CONDITIONS AND DEFINITIONS

ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1 (STD. REF. CONDITIONS OF 25°C, 100 KPA).
NO OVERLOAD PERMITTED AT RATING SHOWN. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM
RATED ALTITUDE AND/OR TEMPERATURE.

NOTES

- 1) FUEL CONSUMPTION TOLERANCE ACCORDING TO ISO 3046/1. TOLERANCE IS + 5% OF FULL LOAD DATA.
- 2) HEAT REJECTION TO JACKET AND EXHAUST TOLERANCE IS ± 10% OF FULL LOAD DATA.
- 3) HEAT REJECTION TO A/C TOLERANCE IS ± 5% OF FULL LOAD DATA.
- 4) HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ± 50% OF FULL LOAD DATA.
- 5) HEAT REJECTION TO LUBE OIL TOLERANCE IS ± 20% OF FULL LOAD DATA.
- 6) THERMAL EFFICIENCY: JACKET HEAT + LUBE OIL HEAT + EXH. HEAT TO 350°F.
- 7) TOTAL EFFICIENCY: ENGINE EFF. + THERMAL EFF. TOLERANCE IS ± 10% OF FULL LOAD DATA.
- 8) TOTAL JW HEAT: COMBINED = JACKET HEAT + OIL COOLER HEAT (heat rate based on treated water)
2-CIRCUIT AND 3 CIRCUIT = JACKET HEAT (heat rate based on treated water)
- 9) TOTAL A/C HEAT: COMBINED AND 3-CIRCUIT = A/C HEAT x A/C HEAT REJ. FACTOR (heat rate based on treated water)
2-CIRCUIT = A/C HEAT x A/C HEAT REJ. FACTOR + O/C HEAT
- 10) EMISSION DATA SHOWN ARE DRY AND NOT TO EXCEED VALUES.
PUBLISHED PART LOAD DATA REQUIRES AIR FUEL RATIO CONTROL.
- 11) MEASURED IN THE INTAKE MANIFOLD PLENUM.
- 12) TIMING INDICATED IS FOR USE WITH THE MINIMUM FUEL METHANE NUMBER SPECIFIED. CONSULT THE APPROPRIATE
FUEL USAGE GUIDE FOR TIMING AT OTHER METHANE NUMBERS.

FUEL USAGE GUIDE

DERATE FACTOR/ENGINE TIMING vs METHANE NUMBER

<30	30	40	49	50	60	64	65	70	75	80	83 to 100
0/--	0.59/14	0.59/16	0.59/18	0.90/14	0.90/16	0.90/17	1.0/16	1.0/18	1.0/21	1.0/22	1.0/23

* Denotes Air Fuel Ratio Control Required for Maximum Rating Shown.

ALTITUDE DERATION FACTORS

A 130	1.00	1.00	1.00	0.98	0.94	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.70
M 120	1.00	1.00	1.00	1.00	0.96	0.93	0.89	0.86	0.83	0.80	0.77	0.74	0.71
B 110	1.00	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.75	0.72
I 100	1.00	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.86	0.82	0.79	0.76	0.73
E 90	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.75
N 80	1.00	1.00	1.00	1.00	1.00	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76
T 70	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.84	0.81	0.77
60	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.96	0.92	0.89	0.85	0.82	0.79
(°F) 50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.84	0.80
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS

A 130	1.43	1.51	1.60	1.69	1.77	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86
M 120	1.33	1.41	1.49	1.58	1.66	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
B 110	1.22	1.30	1.38	1.47	1.55	1.64	1.64	1.64	1.64	1.64	1.64	1.64	1.64
I 100	1.12	1.20	1.28	1.36	1.44	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53
E 90	1.01	1.09	1.17	1.25	1.33	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
N 80	1.00	1.00	1.06	1.14	1.22	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
T 70	1.00	1.00	1.00	1.03	1.11	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
60	1.00	1.00	1.00	1.00	1.00	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
(°F) 50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel and what engine timing to use. Note that deration occurs as the methane number decreases. Methane number is a scale to measure ignition and burning characteristics of various fuels. Representative values are shown below.

Methane	100
Ethane	44
Propane	34
n-Butane	10
Hydrogen	0

Most dry pipeline natural gas has a methane number of 67 or above. The gas quality should be analyzed to determine the percentage of each constituent and then determine the methane number. Consult the dealer or factory for assistance.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various ambient temperatures and altitudes. Use this information to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

It is important to note that the Altitude/Temperature deration and the Fuel Usage Guide deration are not cumulative, i.e., they are not to be added together. The same is true for the Low Energy Fuel deration (reference the Caterpillar Methane Number Program) and the Fuel Usage Guide deration. However, the Altitude/Temperature deration and Low Energy Fuel deration are cumulative; and they must be added together in the method shown below. To determine the actual power available, take the lowest rating between 1) and 2).

- 1) (Altitude/Temperature Deration) + (Low Energy Fuel Deration)
- 2) Fuel Usage Guide Deration

Note: For NA's always add the Low Energy Fuel deration to the Altitude/Temperature deration. For TA engines only add the Low Energy Fuel deration to the Altitude/Temperature deration whenever the Altitude/Temperature deration is less than 1.0 (100%). This will give the actual rating for the engine at the conditions specified.

AFTERCOOLER HEAT REJECTION FACTORS:

Aftercooler heat rejection is given for standard conditions of 77°F and 500 ft altitude. To maintain a constant inlet air manifold temperature, as the ambient air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor to adjust for ambient and altitude conditions. Multiply this factor by the standard aftercooler heat rejection. Failure to properly account for these factors could result in detonation and cause the engine to shut down or fail.



ATTACHMENT C - IMPACT Application Forms

New Source Review Permit Application Form Cover Sheet

Previous Application #: AP-A0000942

*Name of the contact to whom the permit will be issued:

Additional Contact Type (if needed):
Title: First Name: _____
Last Name: _____
Company Name: _____
Job Title: _____
Address: _____
City: _____ State:
Zip Code: _____
Primary Phone No.: _____ E-mail: _____
Mobile Phone No.: _____ Fax No.: _____
Contact Type: Start Date: _____

FACILITY APPLICATION INFORMATION:

General Info:

Has the facility changed location or is it a new/ greenfield facility?
Has a Land Use Planning document been included in this application?
Is the facility located in a sage grouse core area? *
If the facility is in a sage grouse core area, what is the WER number? _____
** For questions about sage grouse core area, contact WY Game & Fish Department.*

Federal Rules Applicability - Facility Level:

Prevention of Significant Deterioration (PSD):
Non-Attainment New Source Review:

Modeling Section:

Has the Air Quality Division been contacted to determine if modeling is required?
Is a modeling analysis part of this application?

Is the proposed project subject to Prevention of Significant Deterioration (PSD) requirements?
Has the Air Quality Division been notified to schedule a pre-application meeting?
Has a modeling protocol been submitted to and approved by the Air Quality Division?
Has the Air Quality Division received a Q/D analysis to submit to the respective FLMs to determine the need for an AQRV analysis?

Required Attachments:

Facility Map ☒
Process Flow Diagram ☒
Modeling Analysis (if applicable) ☒
Land Use Planning Document ☐
Detailed Project Description ☒
Emissions Calculations ☒

I, Charles Cornell Sr. Regulatory Lead
Responsible Official (Printed Name) Title

an Official Representative of the Company, state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the operational information provided and emission rates listed on this application reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all applicable Wyoming Air Quality Standards and Regulations.

Signature: 
(ink)

Date: 8/19/2015

Specific Emission Unit Attributes:

Engine

Company Equipment ID: E1

Company Equipment Description: Natural gas-fired compressor engine #1 (Unit 4874)

Operating Status: Not Yet Installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

Most Recent Construction/ Modification

Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

Name Plate Rating: 1050

Units: hp

Site Rating: 1029

Units: hp

Primary Fuel Type: Field Gas

Secondary Fuel Type:

Model Name and Number: G3516 TA

Engine Type: 4 Stroke Rich Burn

Serial Number Tracking Table:

Serial Number: WPS00138

Order Date: August 2015

Manufacturer Name: Caterpillar

Construction/Installation Commencement Date: TBD

Operation Commencement/ Start-up Date: TBD

Manufacture Date: 6/6/2007

Btu Content: 1119

Units: BTU/scf

Fuel Sulfur Content: Negligible

Units:

Type of Service: Compression

Is diesel engine EPA Tier Certified?

* If yes, list EPA Tier Rating

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

20200253

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment: *If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.*

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standards are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61.
(These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart:

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Engine

Company Equipment ID: E2

Company Equipment Description: Natural gas-fired compressor engine #2 (Unit 4875)

Operating Status: Not Yet Installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

Most Recent Construction/ Modification

Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

Name Plate Rating: 1050

Units: hp

Site Rating: 1029

Units: hp

Primary Fuel Type: Field Gas

Secondary Fuel Type:

Model Name and Number: G3516 TA

Engine Type: 4 Stroke Rich Burn

Serial Number Tracking Table:

Serial Number: WPS00136

Order Date: August 2015

Manufacturer Name: Caterpillar

Construction/Installation Commencement Date: TBD

Operation Commencement/ Start-up Date: TBD

Manufacture Date: 6/6/2007

Btu Content: 1119

Units: BTU/scf

Fuel Sulfur Content: Negligible

Units:

Type of Service: Compression

Is diesel engine EPA Tier Certified?

* If yes, list EPA Tier Rating

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

20200253

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standards are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61.
(These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Subpart ZZZZ - Existing - Area Source - Remote

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Heater/Chiller

Company Equipment ID: H1

Company Equipment Description: Indirect Heater #1 - 1.0 MMBtu/hr unit

Operating Status: Not Yet Installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

Most Recent Construction/ Modification

Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

Firing Type:

Indirect

Heat Input Rating: 1.0

Units: MMBtu/hr

Primary Fuel Type: Field Gas

Secondary Fuel Type:

Heat Content of Fuel: 1119

Units: BTU/scf

Fuel Sulfur Content: Negligible

Units:

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

31000404

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment: *If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.*

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR
61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Heater/Chiller

Company Equipment ID: H2

Company Equipment Description: Indirect Heater #2 - 1.0 MMBtu/hr unit

Operating Status: Not Yet Installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

Most Recent Construction/ Modification

Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

Firing Type:

Indirect

Heat Input Rating:

1.0

Units:

MMBtu/hr

Primary Fuel Type:

Field Gas

Secondary Fuel Type:

Heat Content of Fuel:

1119

Units:

BTU/scf

Fuel Sulfur Content:

Negligible

Units:

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

31000404

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day:

24

Hours/year:

8760

Control Equipment: *If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.*

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standards are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR
61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Pollutant Emissions Form
(submit one for each emission unit)

Emissions Information- The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
	Potential to Emit (PTE)	Units			

Criteria Pollutants:

1.)	Particulate emissions (PE/PM) (formerly particulate matter, PM)			0.37	1.6	AP-42
2.)	PM #10 microns in diameter (PE/PM10)			0.37	1.6	AP-42
3.)	PM #2.5 microns in diameter (PE/PM2.5)			0.37	1.6	AP-42
4.)	Sulfur dioxide (SO ₂)			0.23	1.0	Other
5.)	Nitrogen Oxides (NO _x)			2.44	10.7	Other
6.)	Carbon monoxide (CO)			6.96	30.5	Other
7.)	Volatile organic compounds (VOC)			2.28	10.0	Other
8.)	Lead (Pb)			Neg	Neg	
9.)	Total Hazardous Air Pollutants (HAPs)			0.39	1.7	AP-42
10.)	Fluoride (F)					
11.)	Hydrogen Sulfide (H ₂ S)					
12.)	Mercury (Hg)					
13.)	Total Reduced Sulfur (TRS)					
14.)	Sulfuric Acid Mist (SAM)					

**Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.*

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

Efficiency Standards					
Pre-Controlled Potential Emissions (tons/yr)	Potential to Emit (PTE)	Units	Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination

Pollutants:

1.)	Formaldehyde			0.23	0.99	
2.)	Methanol			0.04	0.17	
3.)	Acetaldehyde			0.03	0.15	
4.)	Acrolein			0.03	0.14	
5.)						
6.)						
7.)						
8.)						

Greenhouse Gases (GHGs)

Efficiency Standards					
Pre-Controlled Potential Emissions (tons/yr)	Potential to Emit (PTE)	Units	Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination

Pollutants:

1.)						
2.)						
3.)						
4.)						
5.)						
6.)						
7.)						
8.)						

Release Point Information:

Complete the table below for *each* release point. Please include release point information for each emission unit. Multiple attachments may be necessary. A release point is a point at which emissions from an emission unit are released into the ambient (outside) air. List each individual release point on a separate pair of lines (release point ID and description). *For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)*

Stack Release Point Information			
Company Release Point ID:	Release Point Type:	Vertical	
E1	Release Point Easting:		607486.5
	Release Point Northing:		4700387.2
Company Release Point Description:	Base Elevation (ft):	7241	
Natural gas-fired compressor engine #1 (4874)	Stack Height (ft):	26.25	
	Stack Diameter (ft):	0.833	
	Exit Gas Velocity (ft/s):		94.35
	Exit Gas Temp (F):	912	
	Exit Gas Flow Rate (acfm):		3087.6
Company Release Point ID:	Release Point Type:	Vertical	
E2	Release Point Easting:		607490.8
	Release Point Northing:		4700368.7
Company Release Point Description:	Base Elevation (ft):	7241	
Natural gas-fired compressor engine #2 (4875)	Stack Height (ft):	26.25	
	Stack Diameter (ft):	0.833	
	Exit Gas Velocity (ft/s):		94.35
	Exit Gas Temp (F):	912	
	Exit Gas Flow Rate (acfm):		3087.6
Company Release Point ID:	Release Point Type:	Vertical	
H1	Release Point Easting:		607511.4
	Release Point Northing:		4700408
Company Release Point Description:	Base Elevation (ft):	7241	
Indirect Heater #1	Stack Height (ft):	12	
	Stack Diameter (ft):	0.5	
	Exit Gas Velocity (ft/s):		54.89
	Exit Gas Temp (F):	601	
	Exit Gas Flow Rate (acfm):		646.7
Company Release Point ID:	Release Point Type:	Vertical	
H2	Release Point Easting:		607512.7
	Release Point Northing:		4700408
Company Release Point Description:	Base Elevation (ft):	7241	
Indirect Heater #2	Stack Height (ft):	12	
	Stack Diameter (ft):	0.5	
	Exit Gas Velocity (ft/s):		54.89
	Exit Gas Temp (F):	601	
	Exit Gas Flow Rate (acfm):		646.7

Complete the table below for each fugitive (area, volume, line) release point. List each individual release point on a separate line.

Fugitive Release Point Information	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	

Control Equipment:

Catalytic NOx Control Technology

Manufacturer: DCL International, Inc.

Date Installed: TBD

Model Name and

Company Control

Number: TBD

Equipment ID: CE1

Company Control Equipment

Description: NSCR Catalyst

Pollutant(s) Controlled:

☒ CO☒ NOx☐ Pb☐ SO2☒ VOC☐ PM☐ PM (FIL)☐ PM Condensable☐ PM 10 (FIL)☐ PM 2.5 (FIL)☐ PM 10☐ PM 2.5☐ Other**NOTE: The following fields require numeric values unless otherwise denoted with an asterisk***

Design Control Efficiency (%):

Capture Efficiency (%):

Operating Control Efficiency (%):

Catalytic Reduction Type:*

Nonselective Catalytic

Reagent Type:

Reagent Injection Rate- specify units:

Reagent Slip Concentration (ppbv):

Reagent Slip Concentration % O2:

Inlet Gas Flow Rate (acfm):

Inlet Gas Temp (F):

Outlet Gas Temp (F):

Air Fuel Ratio Controller:*

Yes



This is the only control equipment on this air contaminant source

If not, this control equipment is:

☐ Primary☐ Secondary☐ Parallel

List all other emission units that are also

vented to this control equipment:*

N/A

List all release point IDs associated with this

E1

control equipment:*

Control Equipment:

Catalytic NOx Control Technology

Manufacturer: DCL International, Inc.Date Installed: TBD

Model Name and

Company Control

Number: TBDEquipment ID: CE2

Company Control Equipment

Description: NSCR Catalyst

Pollutant(s) Controlled:

<input checked="" type="checkbox"/> CO	<input checked="" type="checkbox"/> NOx	<input type="checkbox"/> Pb	<input type="checkbox"/> SO2	<input checked="" type="checkbox"/> VOC	<input type="checkbox"/> PM
<input type="checkbox"/> PM (FIL)	<input type="checkbox"/> PM Condensible	<input type="checkbox"/> PM 10 (FIL)	<input type="checkbox"/> PM 2.5 (FIL)	<input type="checkbox"/> PM 10	<input type="checkbox"/> PM 2.5
<input type="checkbox"/> Other					

NOTE: The following fields require numeric values unless otherwise denoted with an asterisk*

Design Control Efficiency (%): _____ Capture Efficiency (%): _____

Operating Control Efficiency (%): _____

Catalytic Reduction Type:* Nonselective Catalytic

Reagent Type: _____

Reagent Injection Rate- specify units: _____

Reagent Slip Concentration (ppbv): _____

Reagent Slip Concentration % O2: _____

Inlet Gas Flow Rate (acfm): _____

Inlet Gas Temp (F): _____ Outlet Gas Temp (F): _____

Air Fuel Ratio Controller:* Yes☒ This is the only control equipment on this air contaminant sourceIf not, this control equipment is: ☐ Primary ☐ Secondary ☐ Parallel

List all other emission units that are also

vented to this control equipment:* N/AList all release point IDs associated with this E2

control equipment:* _____



April 29, 2015

Air Quality NSR Program
Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002



Reviewer Amb
cc: _____
Modeler _____
D.E. _____
File A0000942
IMP FID 4527

**RE: Jonah Energy LLC
Request for C6 S2 Air Permit Application
Compressor Engine To Be Located at SHB 13-26 Production Facility
Sublette County, Wyoming**

Dear WDEQ:

Jonah Energy LLC is submitting this letter along with the attached air permit forms and associated emissions to the Wyoming Department of Environmental Quality (WDEQ) Air Quality Division (AQD) to request the installation and operation of one (1) compressor engine associated with a line pressure reduction project in the Jonah field of operations. This application is being submitted following the in-person meeting between Jonah Energy LLC and the WDEQ-AQD that occurred on September 26, 2014 with Mr. Cole Anderson, Mr. Andrew Keyfauber and Mr. Josh Nall, and on April 6, 2015 with Mr. Todd Parfait and Mr. Steve Dietrich, along with subsequent phone conversations with the WDEQ-AQD.

Jonah Energy is requesting that the WDEQ issue a C6 S2 air permit for the permanent installation of one (1) compressor engine as part of a line pressure reduction project to determine if a decrease in line pressure will result in an increase in production along with a decrease in emissions in the Jonah field. If successful, the decrease in emissions would be a result of the reduced line pressure minimizing tank flash emissions within the Jonah field. The line pressure reduction project would consist of installing a horizontal separator, up to two (2) low pressure separators and associated heaters and a compressor engine for a maximum of 8760 hours of operation.

Currently, the one (1) compressor engine and associated separator heaters that would be installed at the Stud Horse Butte (SHB) 2-34 production facility have not yet been ordered; therefore, engine-specific information is not yet available at this time. The compressor engine that would be installed at the SHB 13-26 production facility would either be a natural gas-fired four-stroke lean-burn (4SLB) engine or a natural gas-fired four-stroke rich-burn (4SRB) engine with a maximum nameplate horsepower (HP) of 1850 HP. The two (2) separator heaters associated with the line pressure reduction project each have a maximum rating of 1.0 MMBtu/hr heat input. Jonah Energy is requesting to operate the compressor engine and separator heaters up to 8760 hours per year.

Since the compressor engine that would be installed at the SHB 13-26 production facility would likely be a rental unit, Jonah Energy would like the WDEQ-AQD to note that under current circumstances the make/model of engine to be installed will be directly related to the particular engine that is available by the specified rental company at the time the engine is procured. Since Jonah Energy has not chosen a specified engine vendor, Jonah Energy would like to request the flexibility of installing a range of make/model engines. Whichever compressor engine is eventually chosen to be installed at the SHB 13-26 production facility, it would continue to remain less than the maximum nameplate horsepower that would be permitted under this application.

The associated WDEQ-AQD permit application forms, emission calculations and supporting documentation are included with the permit application submittal.

Jonah Energy LLC

707 17th Street, Suite 2700 Denver CO 80202 USA

Chapter 6, Section 2(c)(ii) Offset Demonstration

In a letter dated July 21, 2008, the WDEQ issued an interim policy on demonstration of compliance with Wyoming Air Quality Standards and Regulations Chapter 6, Section 2(c)(ii) for sources in Sublette County. This interim policy requires air permit applications for new or modified emission sources of NO_x and/or VOC to be accompanied by a demonstration that the proposed facility will not prevent the attainment or maintenance of an ambient air quality standard. One option for such demonstration includes emission reductions for NO_x and/or VOC emissions. Emissions reductions that may be used as offsets include activities that result in NO_x and/or VOC emissions reductions within Sublette County, such as projects that result in a change of operation that occur after April 1, 2008.

An analysis of the NO_x and VOC emissions and offsets, if necessary, for the SHB 13-26 compressor engine are identified in **Table 1**.

Table 1
Offset Emissions Analysis – SHB 13-26 Compressor Engine


Facility Emissions	NO _x (tpy)	VOC (tpy)
Emissions Resulting After Compressor Engine and Separator Heater Installation	9.8	12.6
Proposed Emissions Increase/(Decrease) From Proposed Modification	9.8	12.6
Offset Ratio	1.1:1	1.5:1
Emissions Required to be Offset	10.8	18.9

As the emissions resulting from the project will result in a minimal increase of NO_x and VOC, it can be presumed that the compressor engine addition to the SHB 13-26 facility will not cause further impairment to ambient air quality due to the overall reduction of Jonah Energy's emissions from other permitting actions. Jonah Energy requests that the WDEQ offset the NO_x and VOC emissions from the compressor engine installation from Jonah Energy's offset bank. Jonah Energy understands that they have enough NO_x and VOC emission credits available to offset the emissions identified in **Table 1**. We understand that this project will satisfy the WDEQ's Chapter 6, Section 2(c)(ii) interim permitting policy for sources in Sublette County.

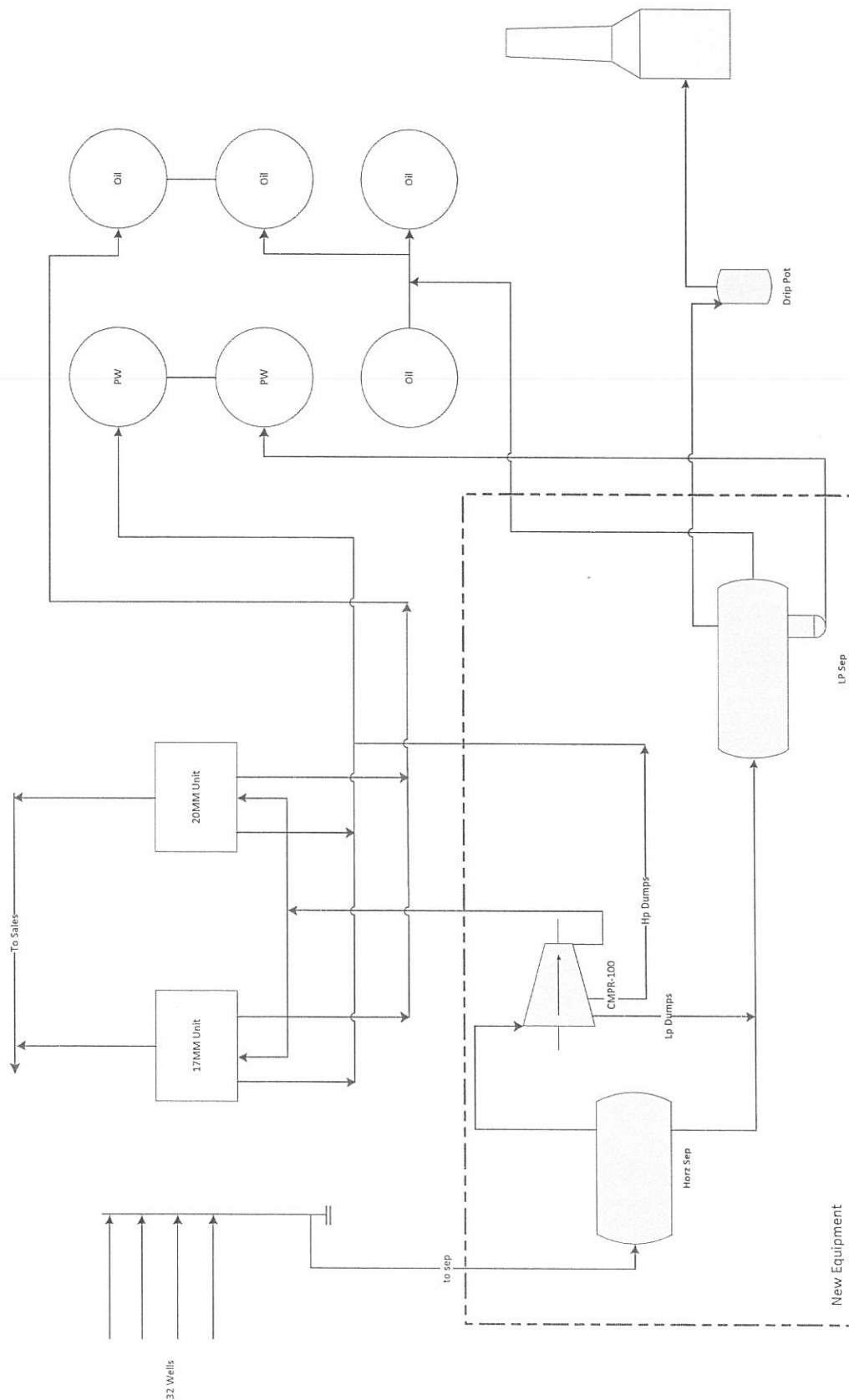
WDEQ permit application forms are included as **Attachment A**, supporting emission calculations are included as **Attachment B**, and a current copy of Jonah Energy's offset bank spreadsheet is included as **Attachment C**. One original signed copy is enclosed, along with a CD that includes the electronic copies of the application forms and associated emissions calculations for the SHB 13-26 compressor engine as part of the line pressure reduction project.

If you have any questions in regards to this application submittal, please contact me at 720.577.1251 or via email at chuck.cornell@jonahenergy.com.

Sincerely,


Charles Cornell
Sr. Regulatory Lead

Compressor Pilot PFD



Legend	
—	3 - Phase
—	Gas
—	Condensate
—	Water

ATTACHMENT A
WYOMING PERMIT APPLICATION FORMS



Air Quality Division

New Source Review Permit Application Form

Is this an addendum to an existing application?

Yes _____

No ☒ XDate of Application: 4/29/2015

Previous Application #: _____

COMPANY INFORMATION:

Company Name: Jonah Energy LLC
 Address: 707 17th Street, Suite 2700
 City: Denver State: Colorado Zip Code: 80202
 Country: USA Phone Number: 720.577.1000

FACILITY INFORMATION:

Facility Name: SHB 13-26 Compressor Engine
 New Facility or Existing Facility: New
 Facility Description: Compressor Engine - Line Pressure Reduction Project
 Facility Class: Minor Operating Status: Not Yet Installed
 Facility Type: Production Site

For Oil & Gas Production Sites ONLY:First Date of Production (FDOP)/Date of Modification: N/A

Does production at this facility contain H2S?*

No****If yes, contact the Division.***

API Number(s): _____

NAICS Code: 211111 Crude Petroleum and Natural Gas Extraction**FACILITY LOCATION:******Enter the facility location in either the latitude/longitude area or section/township/range area. Both are not required.***

Physical Address: _____

City: _____

State: WY

County: _____

OR

Latitude: 42.44618 Longitude: -109.69178 County: Sublette
 Quarter Quarter: SW Quarter: SW
 Section: 26 Township: 29N Range: 108W

For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)**CONTACT INFORMATION:******Note that an Environmental AND NSR Permitting Contact is required for your application to be deemed complete by the agency.***

Title: Mr. First Name: Charles
 Last Name: Cornell

Company Name: Jonah Energy LLCJob Title: Sr. Regulatory LeadAddress: 707 17th Street, Suite 2700City: Denver State: ColoradoZip Code: 80202Primary Phone No.: 720.577.1251 E-mail: chuck.cornell@jonahenergy.comMobile Phone No.: 970.988.6067 Fax No.: _____Contact Type: Environmental contact Start Date: October 6, 2014

Additional Contact Type (if needed): Title: First Name: Last Name: Company Name: Job Title: Address: City: State: Zip Code: Primary Phone No.: E-mail: Mobile Phone No.: Fax No.: Contact Type: Start Date: **FACILITY APPLICATION INFORMATION:****General Info:**

Has the facility changed location or is it a new/ greenfield facility?

Has a Land Use Planning document been included in this application?

Is the facility located in a sage grouse core area?*

If the facility is in a sage grouse core area, what is the WER number?

* For questions about sage grouse core area, contact WY Game & Fish Department.

Federal Rules Applicability - Facility Level:

Prevention of Significant Deterioration (PSD):

Non-Attainment New Source Review:

Modeling Section:

Has the Air Quality Division been contacted to determine if modeling is required?

Is a modeling analysis part of this application?

Is the proposed project subject to Prevention of Significant Deterioration (PSD) requirements?

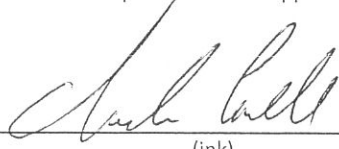
Has the Air Quality Division been notified to schedule a pre-application meeting?

Has a modeling protocol been submitted to and approved by the Air Quality Division?

Has the Air Quality Division received a Q/D analysis to submit to the respective FLMS to determine the need for an AQRV analysis?

Required Attachments:Facility Map ☒Process Flow Diagram ☒Modeling Analysis (if applicable) ☐Land Use Planning Document ☐Detailed Project Description ☒Emissions Calculations ☒I, Charles Cornell
Responsible Official (Printed Name)Sr. Regulatory Lead
Title

an Official Representative of the Company, state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the operational information provided and emission rates listed on this application reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all applicable Wyoming Air Quality Standards and Regulations.

Signature: 
(ink)Date: 4/29/2015

Specific Emission Unit Attributes:

Engine

Company Equipment ID: E1
Company Equipment Description: Natural gas-fired compressor engine

Operating Status: Not Yet Installed
Initial Construction Commencement Date: TBD
Initial Operation Commencement Date: TBD
Most Recent Construction/ Modification
Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is **Reconstruction** or **Temporary Permit** or **Other**, please explain below:

Name Plate Rating: 1850 Units: hp
Site Rating: <1850 Units: hp
Primary Fuel Type: Field Gas
Secondary Fuel Type:
Model Name and Number: TBD
Engine Type: 4 Stroke Rich Burn
Serial Number Tracking Table:
Serial Number: TBD Order Date: TBD
Manufacturer Name: TBD
Construction/Installation Commencement Date: TBD
Operation Commencement/ Start-up Date: TBD
Manufacture Date: TBD
Btu Content: 1120 Units:
Fuel Sulfur Content: Neg Units:
Type of Service: Compression
Is diesel engine EPA Tier Certified? * If yes, list EPA Tier Rating

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24
Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant:

Proposed BACT:

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐

Yes

☒

No

Pollutant:

Proposed LAER:

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

Subject to subpart

*New Source Performance Standard are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: Potentially NSPS JJJJ, depending on manufacture date

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

Not Affected

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61.
(These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart:

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

Subject to subpart

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: Potentially MACT ZZZZ, depending on manufacture date

Prevention of Significant Deterioration (PSD):

Not Affected

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

Not Affected

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Engine

Company Equipment ID: E1
 Company Equipment Description: Natural gas-fired compressor engine

Operating Status: Not Yet Installed
 Initial Construction Commencement Date: TBD
 Initial Operation Commencement Date: TBD
 Most Recent Construction/ Modification Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is **Reconstruction** or **Temporary Permit** or **Other**, please explain below:

Name Plate Rating: 1850 Units: hp
 Site Rating: <1850 Units: hp
 Primary Fuel Type: Field Gas
 Secondary Fuel Type:
 Model Name and Number: TBD
 Engine Type: 4 Stroke Lean Burn
 Serial Number Tracking Table:
 Serial Number: TBD Order Date: TBD
 Manufacturer Name: TBD
 Construction/Installation Commencement Date: TBD
 Operation Commencement/ Start-up Date: TBD
 Manufacture Date: TBD
 Btu Content: 1120 Units:
 Fuel Sulfur Content: Neg Units:
 Type of Service: Compression
 Is diesel engine EPA Tier Certified? * If yes, list EPA Tier Rating

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24
 Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐ Yes ☒ No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐ Yes ☒ No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: Potentially NSPS JJJJ, depending on manufacture date

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61.
(These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: Potentially MACT ZZZZ, depending on manufacture date

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Heater/Chiller

Company Equipment ID: H1

Company Equipment Description: Indirect Heater #1 - 1.0 MMBtu/hr unit

Operating Status: Not yet installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

Most Recent Construction/ Modification

Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

Firing Type:

Indirect

Heat Input Rating:

1.0

Units:

MMBtu/hr

Primary Fuel Type:

Field Gas

Secondary Fuel Type:

Heat Content of Fuel:

1120

Units:

BTU/scf

Fuel Sulfur Content:

Neg

Units:

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2310021100

Potential Operating Schedule:

Provide the operating schedule for this emission unit.

Hours/day:

24

Hours/year:

8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐ Yes ☒ No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐ Yes ☒ No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standard are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR
61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Heater/Chiller

Company Equipment ID: H2

Company Equipment Description: Indirect Heater #2 - 1.0 MMBtu/hr unit

Operating Status: Not yet installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

Most Recent Construction/ Modification
Commencement Date: TBD

Most Recent Operation Commencement Date: TBD

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Construction (Greenfield/New Facility)

If reason is *Reconstruction* or *Temporary Permit* or *Other*, please explain below:

Firing Type:

Indirect

Heat Input Rating: 1.0

Units: MMBtu/hr

Primary Fuel Type: Field Gas

Secondary Fuel Type:

Heat Content of Fuel: 1120

Units: BTU/scf

Fuel Sulfur Content: Neg

Units:

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2310021100

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24

Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

☐ Yes ☒ No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

☐ Yes ☒ No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

*New Source Performance Standards are listed under 40 CFR 60-
Standards of Performance for New Stationary Sources.*

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

*National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR
61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).*

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

*National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
standards are listed under 40 CFR 63*

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Emissions Information- The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

Pre-Controlled Potential Emissions (tons/year)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/year)	Basis for Determination
	Potential to Emit (PTE)	Units			

Criteria Pollutants:

1.)	Particulate emissions (PE/PM) (formerly particulate matter, PM)			0.38	1.67	AP-42
2.)	PM #10 microns in diameter (PE/PM10)			0.38	1.67	AP-42
3.)	PM #2.5 microns in diameter (PE/PM2.5)			0.38	1.67	AP-42
4.)	Sulfur dioxide (SO ₂)			0.27	1.16	Other
5.)	Nitrogen Oxides (NO _x)			2.24	9.79	Other
6.)	Carbon monoxide (CO)			6.28	27.52	Other
7.)	Volatile organic compounds (VOC)			2.87	12.55	Other
8.)	Lead (Pb)			Neg	Neg	
9.)	Total Hazardous Air Pollutants (HAPs)			0.36	2.85	AP-42
10.)	Fluoride (F)			N/A	N/A	
11.)	Hydrogen Sulfide (H ₂ S)			N/A	N/A	
12.)	Mercury (Hg)			N/A	N/A	
13.)	Total Reduced Sulfur (TRS)			N/A	N/A	
14.)	Sulfuric Acid Mist (SAM)			N/A	N/A	

**Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.*

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

Pre-Controlled Potential Emissions (tons/year)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/year)	Basis for Determination
	Potential to Emit (PTE)	Units			

Pollutants:

1.)	Formaldehyde			0.29	1.25	
2.)	Acetaldehyde			0.16	0.69	
3.)	Acrolein			0.1	0.42	
4.)						
5.)						
6.)						

Greenhouse Gases (GHGs)

Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
	Potential to Emit (PTE)	Units			

Pollutants:

1.)						
2.)						
3.)						
4.)						
5.)						
6.)						

Control Equipment:

Catalytic NOx Control Technology

Manufacturer: TBD Date Installed: TBD
 Model Name and Number: TBD Company Control Equipment ID: E1-control
 Company Control Equipment Description: NSCR with AFRC

Pollutant(s) Controlled: ☒ CO ☒ NOx ☐ Pb ☐ SO2 ☒ VOC ☐ PM
☐ PM (FIL) ☐ PM Condensable ☐ PM 10 (FIL) ☐ PM 2.5 (FIL) ☐ PM 10 ☐ PM 2.5
☐ Other

NOTE: The following fields require numeric values unless otherwise denoted with an asterisk*

Design Control Efficiency (%): _____ Capture Efficiency (%): _____

Operating Control Efficiency (%): _____

Catalytic Reduction Type:* Nonselective Catalytic

Reagent Type: _____

Reagent Injection Rate- specify units: _____

Reagent Slip Concentration (ppbv): _____

Reagent Slip Concentration % O2: _____

Inlet Gas Flow Rate (acfm): _____

Inlet Gas Temp (F): _____ Outlet Gas Temp (F): _____

Air Fuel Ratio Controller:* Yes

☒ This is the only control equipment on this air contaminant source

If not, this control equipment is: ☐ Primary ☐ Secondary ☐ Parallel

List all other emission units that are also

vented to this control equipment:* N/A

List all release point IDs associated with this

control equipment:* E1

Release Point Information:

Complete the table below for *each* release point. Please include release point information for each emission unit. Multiple attachments may be necessary. A release point is a point at which emissions from an emission unit are released into the ambient (outside) air. List each individual release point on a separate pair of lines (release point ID and description). *For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)*

Stack Release Point Information	
Company Release Point ID:	Release Point Type: <input type="text" value="Vertical"/>
E1-stack	Release Point Latitude: 42.44618
	Release Point Longitude: -109.69178
Company Release Point Description:	Base Elevation (ft): 7224
Compressor engine exhaust stack	Stack Height (ft): 1.5X bldg height
	Stack Diameter (ft): TBD
	Exit Gas Velocity (ft/s): #VALUE!
	Exit Gas Temp (F): >500
	Exit Gas Flow Rate (acfm): TBD
Company Release Point ID:	Release Point Type: <input type="text"/>
	Release Point Latitude: <input type="text"/>
	Release Point Longitude: <input type="text"/>
Company Release Point Description:	Base Elevation (ft): <input type="text"/>
	Stack Height (ft): <input type="text"/>
	Stack Diameter (ft): <input type="text"/>
	Exit Gas Velocity (ft/s): <input type="text"/>
	Exit Gas Temp (F): <input type="text"/>
	Exit Gas Flow Rate (acfm): <input type="text"/>
Company Release Point ID:	Release Point Type: <input type="text"/>
	Release Point Latitude: <input type="text"/>
	Release Point Longitude: <input type="text"/>
Company Release Point Description:	Base Elevation (ft): <input type="text"/>
	Stack Height (ft): <input type="text"/>
	Stack Diameter (ft): <input type="text"/>
	Exit Gas Velocity (ft/s): <input type="text"/>
	Exit Gas Temp (F): <input type="text"/>
	Exit Gas Flow Rate (acfm): <input type="text"/>
Company Release Point ID:	Release Point Type: <input type="text"/>
	Release Point Latitude: <input type="text"/>
	Release Point Longitude: <input type="text"/>
Company Release Point Description:	Base Elevation (ft): <input type="text"/>
	Stack Height (ft): <input type="text"/>
	Stack Diameter (ft): <input type="text"/>
	Exit Gas Velocity (ft/s): <input type="text"/>
	Exit Gas Temp (F): <input type="text"/>
	Exit Gas Flow Rate (acfm): <input type="text"/>

Complete the table below for each fugitive (area, volume, line) release point. List each individual release point on a separate line.

Fugitive Release Point Information	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	
Company Release Point ID:	Release Point Latitude: _____
	Release Point Longitude: _____
	Release Height (ft): _____
Company Release Point Description:	

ATTACHMENT B
SUPPORTING EMISSION CALCULATIONS

Summary of Criteria Pollutant Emissions

Jonah Energy LLC

SHB 13-26 Compressor Engine

Unit ID	Source	NOx		CO		VOC		SO2		PM10 / PM2.5	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
E1	Natural gas-fired Lean-Burn Compressor Engine, 1850 HP	2.04	8.93	4.08	17.86	2.85	12.50	0.24	1.05	0.19	0.82
E1	Natural gas-fired Rich-Burn Compressor Engine, 1850 HP	2.04	8.93	6.12	26.80	2.85	12.50	0.24	1.05	0.37	1.60
H1	Natural gas-fired separator heater #1, 1.0 MM/Btu/hr	0.10	0.43	0.08	0.36	0.005	0.02	0.01	0.06	0.007	0.03
H2	Natural gas-fired separator heater #2, 1.0 MM/Btu/hr	0.10	0.43	0.08	0.36	0.005	0.02	0.01	0.06	0.007	0.03
	Totals - With Lean-Burn Engine	2.24	9.79	4.24	18.59	2.87	12.55	0.27	1.16	0.20	0.89
	Totals - With Rich-Burn Engine	2.24	9.79	6.28	27.52	2.87	12.55	0.27	1.16	0.38	1.67

Notes:

(1) Engine and heater emissions are based upon a maximum of 8760 operating hours

CALCULATIONS AND COMPUTATIONS

Emission Source:	Compressor Engine
Source Type:	Natural Gas-Fired RICE - Rich Burn
Site-Rated Horsepower (HP)	1850 Max Permitted Horsepower
Maximum Fuel Usage (Btu/bhp-hr)	10182 Manf Spec Sheet, HHV
Number of Units:	1
Natural Gas Heating Value (BTU/scf)	1120 Analysis Data
Sulfur Content of Fuel (grains/scf):	0.05 Estimated
Operating Hours per Year:	8760

One (1) Compressor Engine

Compound	Emission	Emission Rate	
	Factor (a)	Hourly (b) (Lbs/Hr)	Annual (c) (Tons/Year)
NOx	0.5	2.04	8.93
CO	1.5	6.12	26.80
VOC	0.7	2.85	12.50
HCHO	0.05	0.20	0.89
SO2	0.013	0.24	1.05
PM-10 - total	0.02	0.37	1.60

Notes:

- (a) Emission factors for NOx, CO, VOC and HCHO (g/hp-hr) based upon proposed WDEQ BACT limits
Emission factor for SO2 (lb/MMBtu) based maximum estimated sulfur content of natural gas of 5 grains/100 scf
PM10 emission factor (lb/MMBtu) from USEPA AP-42, Chapter 3.2, Table 3.2-3 (4SRB), dated July 2000.
PM10 emission factor includes PM10 filterable and PM condensable
- (b) Hourly Emission Rate (Lbs/Hr) = (Emission Factor, g/hp-hr) * (Horsepower, HP) / 453.6
Hourly Emission Rate (Lbs/Hr) = (Emission Factor, lb/MMBtu) * (Horsepower, HP) * (Fuel Consumption, Btu/bhp-hr) / 1,000,000
- (c) Annual Emission Rate (Tons/Yr) = (Hourly Emission Rate, Lbs/Hr) * (Hour of Operation Per Year, Hr/Yr) / (2,000 Lbs/Ton)

CALCULATIONS AND COMPUTATIONS

Emission Source:	Compressor Engine
Source Type:	Natural Gas-Fired RICE - Lean Burn
Site-Rated Horsepower (HP)	1850 Max Permitted Horsepower
Maximum Fuel Usage (Btu/bhp-hr)	10182 Manf Spec Sheet, HHV
Number of Units:	1
Natural Gas Heating Value (BTU/scf)	1120 Analysis Data
Sulfur Content of Fuel (grains/scf):	0.05 Estimated
Operating Hours per Year:	8760

One (1) Compressor Engine

Compound	Emission	Emission Rate	
	Factor (a)	Hourly (b)	Annual (c)
		(Lbs/Hr)	(Tons/Year)
NOx	0.5	2.04	8.93
CO	1.0	4.08	17.86
VOC	0.7	2.85	12.50
HCHO	0.07	0.29	1.25
SO2	0.013	0.24	1.05
PM-10 - total	0.01	0.19	0.82

Notes:

- (a) Emission factors for NOx, CO, VOC and HCHO (g/hp-hr) based upon proposed WDEQ BACT limits
Emission factor for SO2 (lb/MMBtu) based maximum estimated sulfur content of natural gas of 5 grains/100 scf
PM10 emission factor (lb/MMBtu) from USEPA AP-42, Chapter 3.2, Table 3.2-2 (4SLB), dated July 2000.
PM10 emission factor includes PM10 filterable and PM condensable
- (b) Hourly Emission Rate (Lbs/Hr) = (Emission Factor, g/hp-hr) * (Horsepower, HP) / 453.6
Hourly Emission Rate (Lbs/Hr) = (Emission Factor, lb/MMBtu) * (Horsepower, HP) * (Fuel Consumption, Btu/bhp-hr) / 1,000,000
- (c) Annual Emission Rate (Tons/Yr) = (Hourly Emission Rate, Lbs/Hr) * (Hour of Operation Per Year, Hr/Yr) / (2,000 Lbs/Ton)

CALCULATIONS AND COMPUTATIONS

Emission Source:	Separator Heaters
Source Type:	Natural Gas-Fired Heaters
Heat Input (mmBtu/hr):	1.00 Permitted heat input
Number of Units:	2
Natural Gas Consumption (MMscf/yr)	7.8 calculated; one heater
Natural Gas Consumption (MMscf/yr)	15.6 calculated; 2 heaters
Natural Gas Heating Value (BTU/scf)	1120 Analysis Data
Sulfur Content of Fuel (grains/scf):	0.05 Estimated
Operating Hours per Year:	8760

One Separator Heater

Compound	Emission	Emission Rate	
	Factor (a)	Hourly (b)	Annual (c)
		(Lbs/Hr)	(Tons/Year)
NOx	100	0.10	0.43
CO	84	0.08	0.36
VOC	5.5	0.005	0.02
SO2	1.27E-02	0.01	0.06
PM-10	7.60	0.007	0.03

Two Separator Heaters

Compound	Emission	Emission Rate	
	Factor (a)	Hourly (b)	Annual (c)
		(Lbs/Hr)	(Tons/Year)
NOx	100	0.20	0.86
CO	84	0.16	0.72
VOC	5.5	0.01	0.05
SO2	1.27E-02	0.03	0.11
PM-10	7.60	0.01	0.07

Notes:

- (a) Emission factors (lb/MMscf) based on USEPA AP-42, Chapter 1.4, Tables 1.4-1 and 1.4-2, dated July 1998, except for SO2
Emission factor for SO2 (lb/MMBtu) based assumed sulfur content of natural gas
- (b) Hourly Emission Rate (Lbs/Hr) except for SO2 = (Emission Factor, lb/MMscf) * (Heat Input, MMBtu/hr) *
(Actual Natural Gas Heating Value, Btu/scf) / (AP-42 Natural Gas Heating Value, Btu/scf)
- (b) Hourly Emission Rate (Lbs/Hr) for SO2 = (Emission Factor, Lb/MMBtu) * (Heat Input, MMBtu/hr)
- (c) Annual Emission Rate (Tons/Yr) = (Hourly Emission Rate, Lbs/Hr) * (Hour of Operation Per Year, Hr/Yr) / (2,000 Lbs/Ton)

Calculations and Computations												
					Natural Gas Combustion		Natural Gas-Fired Compressor Engine Emissions					
Pollutant	Type ^(a)	Emission Factor			Maximum Heat Input,	Average Heat Input,	Emission Rate, One Engine			Emission Rate, One Engines		Major
		AP-42 Section 3.2, 7/00 - Natural Gas-Fired Reciprocating Engines - Rich Burn			one engine							
		(g/bhp-hr)	(lb/MMBtu) ^(d)	Rating	(MMBtu/Hr) ^(b)	(MMBtu/Hr) ^(c)	Hourly ^(e) (lb/hr)	Annual (lbs/yr)	Annual ^(f) (tpy)	Hourly ^(e) (lb/hr)	Annual ^(f) (tpy)	(Y/N)
1,1,2,2-Tetrachloroethane	HAP		2.53E-05	C	18.84	18.84	4.77E-04	4.2	2.09E-03	4.77E-04	2.09E-03	No
1,1,2-Trichloroethane	HAP		1.53E-05	E	18.84	18.84	2.88E-04	2.5	1.26E-03	2.88E-04	1.26E-03	No
1,3-Butadiene	HAP		6.63E-04	D	18.84	18.84	1.25E-02	109.4	5.47E-02	1.25E-02	5.47E-02	No
1,3-Dichloropropene	HAP		1.27E-05	E	18.84	18.84	2.39E-04	2.1	1.05E-03	2.39E-04	1.05E-03	No
Acetaldehyde	HAP		2.79E-03	C	18.84	18.84	5.26E-02	460.4	2.30E-01	5.26E-02	2.30E-01	No
Acrolein	HAP		2.63E-03	C	18.84	18.84	4.95E-02	434.0	2.17E-01	4.95E-02	2.17E-01	No
Benzene	HAP		1.58E-03	C	18.84	18.84	2.98E-02	260.7	1.30E-01	2.98E-02	1.30E-01	No
Carbon Tetrachloride	HAP		1.77E-05	E	18.84	18.84	3.33E-04	2.9	1.46E-03	3.33E-04	1.46E-03	No
Chlorobenzene	HAP		1.29E-05	E	18.84	18.84	2.43E-04	2.1	1.06E-03	2.43E-04	1.06E-03	No
Chloroform	HAP		1.37E-05	E	18.84	18.84	2.58E-04	2.3	1.13E-03	2.58E-04	1.13E-03	No
Ethylbenzene	HAP		2.48E-05	E	18.84	18.84	4.67E-04	4.1	2.05E-03	4.67E-04	2.05E-03	No
Ethylene Dibromide	HAP		2.13E-05	E	18.84	18.84	4.01E-04	3.5	1.76E-03	4.01E-04	1.76E-03	No
Formaldehyde	HAP	0.05			18.84	18.84	2.04E-01	1786.4	8.93E-01	2.04E-01	8.93E-01	No
Methanol	HAP		3.06E-03	D	18.84	18.84	5.76E-02	504.9	2.52E-01	5.76E-02	2.52E-01	No
Methylene Chloride	HAP		4.12E-05	C	18.84	18.84	7.76E-04	6.8	3.40E-03	7.76E-04	3.40E-03	No
Naphthalene	HAP		9.71E-05	E	18.84	18.84	1.83E-03	16.0	8.01E-03	1.83E-03	8.01E-03	No
PAH	HAP		1.41E-04	D	18.84	18.84	2.66E-03	23.3	1.16E-02	2.66E-03	1.16E-02	No
Styrene	HAP		1.19E-05	E	18.84	18.84	2.24E-04	2.0	9.82E-04	2.24E-04	9.82E-04	No
Toluene	HAP		5.58E-04	A	18.84	18.84	1.05E-02	92.1	4.60E-02	1.05E-02	4.60E-02	No
Vinyl Chloride	HAP		7.18E-06	E	18.84	18.84	1.35E-04	1.2	5.92E-04	1.35E-04	5.92E-04	No
Xylene	HAP		1.95E-04	A	18.84	18.84	3.67E-03	32.2	1.61E-02	3.67E-03	1.61E-02	No
							0.43	3753.0				
Hours of Operation		8,760 hours/yr										No
Number of Engines		1										
Horsepower		1,850 HP										
Fuel Consumption		10,182 Btu/bhp-hr										
Heat Input		18.84 MMBtu/hr										
							Compressor Engine Total HAPs		1.88	1.88		No
							Maximum Individual HAP		0.89	0.89		
NSCR Control Efficiency =		0.0% Assume 0% for calcs										
Notes: (a) Type = HAP for Hazardous Air Pollutant. (b) Maximum heat input rate for the temporary compressor engine is based on calculated heat input rate of 18.84 MMBtu/hr (c) Assume average heat input rate is the same as maximum heat input rate. (d) Emission factors from AP-42, Section 3.2, Tables 3.2-3 for 4SRB engines except formaldehyde. Formaldehyde factor based on WDEQ BACT (e) Hourly Emission Rate (lb/hr) = [Heat Input Rate (MMBtu/Hr) * Emission Factor (lb/MMBtu)] (f) Annual Emission Rate (tpy) = (Average Hourly Emission Rate, lb/hr) * (8760 hr/yr) / (2,000 lb/ton)												

Calculations and Computations												
					Natural Gas Combustion		Natural Gas-Fired Compressor Engine Emissions					
Pollutant	Type ^(a)	Emission Factor			Maximum Heat Input,	Average Heat Input,	Emission Rate, One Engine			Emission Rate, One Engines		Major
		AP-42 Section 3.2, 7/00 - Natural Gas-Fired Reciprocating Engines - Lean Burn			one engine		Hourly ^(d) (lb/hr)	Annual (lbs/yr)	Annual ^(f) (tpy)	Hourly ^(d) (lb/hr)	Annual ^(f) (tpy)	
		(g/bhp-hr)	(lb/MMBtu) ^(d)	Rating	(MMBtu/Hr) ^(b)	(MMBtu/Hr) ^(c)						
1,1,2,2-Tetrachloroethane	HAP		4.00E-05	E	18.84	18.84	7.53E-04	6.6	3.30E-03	7.53E-04	3.30E-03	No
1,1,2-Trichloroethane	HAP		3.18E-05	E	18.84	18.84	5.99E-04	5.2	2.62E-03	5.99E-04	2.62E-03	No
1,3-Butadiene	HAP		2.67E-04	D	18.84	18.84	5.03E-03	44.1	2.20E-02	5.03E-03	2.20E-02	No
1,3-Dichloropropene	HAP		2.64E-05	E	18.84	18.84	4.97E-04	4.4	2.18E-03	4.97E-04	2.18E-03	No
2-Methylnaphthalene	HAP		3.32E-05	C	18.84	18.84	6.25E-04	5.5	2.74E-03	6.25E-04	2.74E-03	No
2,2,4-Trimethylpentane	HAP		2.50E-04	C	18.84	18.84	4.71E-03	41.3	2.06E-02	4.71E-03	2.06E-02	No
Acenaphthene	HAP		1.25E-06	C	18.84	18.84	2.35E-05	0.2	1.03E-04	2.35E-05	1.03E-04	No
Acenaphthylene	HAP		5.53E-06	C	18.84	18.84	1.04E-04	0.9	4.56E-04	1.04E-04	4.56E-04	No
Acetaldehyde	HAP		8.36E-03	A	18.84	18.84	1.57E-01	1379.5	6.90E-01	1.57E-01	6.90E-01	No
Acrolein	HAP		5.14E-03	A	18.84	18.84	9.68E-02	848.1	4.24E-01	9.68E-02	4.24E-01	No
Benzene	HAP		4.40E-04	A	18.84	18.84	8.29E-03	72.6	3.63E-02	8.29E-03	3.63E-02	No
Benzo(b)fluoranthene	HAP		1.66E-07	D	18.84	18.84	3.13E-06	0.0	1.37E-05	3.13E-06	1.37E-05	No
Benzo(e)pyrene	HAP		4.15E-07	D	18.84	18.84	7.82E-06	0.1	3.42E-05	7.82E-06	3.42E-05	No
Benzo(g,h,i)perylene	HAP		4.14E-07	D	18.84	18.84	7.80E-06	0.1	3.42E-05	7.80E-06	3.42E-05	No
Biphenyl	HAP		2.12E-04	D	18.84	18.84	3.99E-03	35.0	1.75E-02	3.99E-03	1.75E-02	No
Carbon Tetrachloride	HAP		3.67E-05	E	18.84	18.84	6.91E-04	6.1	3.03E-03	6.91E-04	3.03E-03	No
Chlorobenzene	HAP		3.04E-05	E	18.84	18.84	5.73E-04	5.0	2.51E-03	5.73E-04	2.51E-03	No
Chloroform	HAP		2.85E-05	E	18.84	18.84	5.37E-04	4.7	2.35E-03	5.37E-04	2.35E-03	No
Chrysene	HAP		6.93E-07	C	18.84	18.84	1.31E-05	0.1	5.72E-05	1.31E-05	5.72E-05	No
Ethylbenzene	HAP		3.97E-05	B	18.84	18.84	7.48E-04	6.6	3.28E-03	7.48E-04	3.28E-03	No
Ethylene Dibromide	HAP		4.43E-05	E	18.84	18.84	8.34E-04	7.3	3.65E-03	8.34E-04	3.65E-03	No
Fluoranthene	HAP		1.11E-06	C	18.84	18.84	2.09E-05	0.2	9.16E-05	2.09E-05	9.16E-05	No
Fluorene	HAP		5.67E-06	C	18.84	18.84	1.07E-04	0.9	4.68E-04	1.07E-04	4.68E-04	No
Formaldehyde	HAP	0.07			18.84	18.84	2.85E-01	2500.9	1.25E+00	2.85E-01	1.25E+00	No
Methanol	HAP		2.50E-03	B	18.84	18.84	4.71E-02	412.5	2.06E-01	4.71E-02	2.06E-01	No
Methylene Chloride	HAP		2.00E-05	C	18.84	18.84	3.77E-04	3.3	1.65E-03	3.77E-04	1.65E-03	No
n-Hexane	HAP		1.11E-03	C	18.84	18.84	2.09E-02	183.2	9.16E-02	2.09E-02	9.16E-02	No
Naphthalene	HAP		7.44E-05	C	18.84	18.84	1.40E-03	12.3	6.14E-03	1.40E-03	6.14E-03	No
PAH	HAP		2.69E-05	D	18.84	18.84	5.07E-04	4.4	2.22E-03	5.07E-04	2.22E-03	No
Phenanthrene	HAP		1.04E-05	D	18.84	18.84	1.96E-04	1.7	8.58E-04	1.96E-04	8.58E-04	No
Pyrene	HAP		1.36E-06	C	18.84	18.84	2.56E-05	0.2	1.12E-04	2.56E-05	1.12E-04	No
Styrene	HAP		2.36E-05	E	18.84	18.84	4.45E-04	3.9	1.95E-03	4.45E-04	1.95E-03	No
Tetrachloroethane	HAP		2.48E-06	D	18.84	18.84	4.67E-05	0.4	2.05E-04	4.67E-05	2.05E-04	No
Toluene	HAP		4.08E-04	B	18.84	18.84	7.69E-03	67.3	3.37E-02	7.69E-03	3.37E-02	No
Vinyl Chloride	HAP		1.49E-05	C	18.84	18.84	2.81E-04	2.5	1.23E-03	2.81E-04	1.23E-03	No
Xylene	HAP		1.84E-04	B	18.84	18.84	3.47E-03	30.4	1.52E-02	3.47E-03	1.52E-02	No
							0.65	5697.4				
Hours of Operation		8,760 hours/yr										No
Number of Engines		1										
Horsepower		1,850 HP										
Fuel Consumption		10,182 Btu/bhp-hr		Compressor Engine Total HAPs				2.85		2.85		No
Heat Input		18.84 MMBtu/hr		Maximum Individual HAP				1.25		1.25		
NSCR Control Efficiency =		0.0% Assume 0% for calcs										
Notes: (a) Type = HAP for Hazardous Air Pollutant. (b) Maximum heat input rate for the temporary compressor engine is based on calculated heat input rate of 18.84 MMBtu/hr (c) Assume average heat input rate is the same as maximum heat input rate. (d) Emission factors from AP-42, Section 3.2, Tables 3.2-2 for 4SLB engines except formaldehyde. Formaldehyde factor based on WDEQ BACT (e) Hourly Emission Rate (lb/hr) = [Heat Input Rate (MMBtu/Hr) * Emission Factor (lb/MMBtu)] (f) Annual Emission Rate (tpy) = (Average Hourly Emission Rate, lb/hr) * (8760 hr/yr) / (2,000 lb/ton)												

ATTACHMENT C

JONAH ENERGY OFFSET BANK SPREADSHEET

12/15/2008	10/7/2009	Eng Area	Stud Horse Bldg 1-26 CF	MD-8747	1/15/2010	24.27	4.5	43.2	1.9	6.0	0.0	-11.5	2.6	-11.5	2.8	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
12/17/2008	10/7/2009	Eng Area	Stud Horse Bldg 18-14 CF	MD-8820	1/15/2010	19.3	3.7	16.2	0.4	0.0	0.0	2.6	3.3	3.9	3.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
12/17/2008	10/7/2009	Eng Area	Stud Horse Bldg 12-29 CF	MD-8876	1/15/2010	23.1	4.4	92.3	1.6	0.0	0.0	-6.2	2.1	-6.2	3.1	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
1/15/2009	10/8/2009	Eng Area	Stud Horse Bldg 84-9 CF	MD-8881	1/15/2010	20.1	4.0	24.8	0.8	0.0	0.0	-14.7	7.2	-14.7	3.5	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
1/20/2009	10/9/2009	Eng Area	Stud Horse Bldg 1-29 CF	MD-8912	1/15/2010	22.0	4.3	23.0	4.0	0.0	0.0	-19.0	-0.5	-19.0	-0.5	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
1/26/2009	10/13/2009	Eng Area	Crusian Federal 15-24	MD-8973	1/15/2010	4.6	0.6	0.6	0.0	0.0	0.0	4.0	4.6	4.9	0.7	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
1/27/2009	10/14/2009	Eng Area	Yellow Point 18-13 CF	MD-8972	1/15/2010	20.4	3.5	87.6	3.4	0.0	0.0	-67.2	0.1	-67.2	0.1	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
1/29/2009	10/16/2009	Eng Area	Bluelands 6-10 CF	MD-8919	1/15/2010	5.7	1.3	17.2	0.4	0.0	0.0	-11.6	0.7	-11.6	0.8	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
2/10/2009	10/20/2009	Eng Area	Crusian Federal 10-36	MD-9065	1/15/2010	3.9	0.6	0.6	0.0	0.0	0.0	3.9	0.6	3.9	0.7	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
2/16/2009	10/26/2009	Eng Area	Stud Horse Bldg 40-2 CF	MD-9059	1/15/2010	20.7	4.2	0.8	0.0	0.0	0.0	20.7	4.2	21.1	4.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
2/26/2009	10/26/2009	Eng Area	Crusian Unit 2-11	MD-9070	1/15/2010	5.3	0.6	0.0	0.0	0.0	0.0	5.3	-0.6	5.6	0.7	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
3/12/2009	10/16/2009	Eng Area	Stud Horse Bldg 124-11 CF	MD-9149	1/15/2010	16.1	3.8	17.9	0.1	0.0	0.0	-1.8	3.7	-1.8	4.1	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
3/24/2009	10/24/2009	Eng Area	Crusian Federal 7-25	CT-7298	1/15/2010	9.0	2.3	0.9	0.0	0.0	0.0	0.0	0.5	1.2	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
3/27/2009	10/16/2009	Eng Area	Stud Horse Bldg 1-34 CF	MD-9216	1/15/2010	9.0	2.3	11.4	1.6	0.0	0.0	-1.5	0.7	-1.5	0.8	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
4/1/2009	10/11/2009	Eng Area	Stud Horse Bldg 1-27 CF	MD-9252	1/15/2010	10.1	5.0	61.5	9.6	0.0	0.0	-42.4	-4.6	-42.4	-4.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
4/2/2009	10/12/2009	Eng Area	Crusian 5-31 CF	MD-9309	1/15/2010	9.6	1.9	10.7	1.0	0.0	0.0	-2.1	0.9	-2.1	1.0	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
4/13/2009	10/12/2009	Eng Area	Crusian Unit 2-11	CT-7258	1/15/2010	2.6	0.8	0.0	0.0	0.0	0.0	2.6	0.8	2.9	0.9	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
4/20/2009	10/20/2009	Eng Area	Crusian 5-29	MD-9351	1/15/2010	7.3	2.2	36.6	1.0	0.0	0.0	-29.1	0.4	-29.1	0.4	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
5/2/2009	NA	Eng Area	Stud Horse Bldg 12-35 CF	MD-7702	1/15/2010	27.4	6.9	0.0	0.0	22.7	2.5	4.4	-4.4	7.1	4.0	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
5/22/2009	5/22/2009	Eng Area	Stud Horse Bldg 12-35 CF	MD-9455	1/15/2010	14.8	4.6	14.8	2.6	0.0	0.0	4.9	2.9	7.4	2.2	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
5/23/2009	5/23/2009	Eng Area	Stud Horse Bldg 1-28 CF	MD-9455	1/15/2010	11.9	3.7	0.0	0.0	0.0	0.0	11.9	3.7	12.6	4.0	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
5/23/2009	5/23/2009	Eng Area	Stud Horse Bldg 1-28 CF	CT-6545	1/15/2010	10.7	0.7	0.0	0.0	0.0	0.0	10.7	0.7	10.7	0.7	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Yellow Point 18-14 CF	MD-9476	1/15/2010	12.6	3.3	7.5	3.1	0.0	0.0	5.1	0.2	7.7	0.2	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009	10/2/2009	Eng Area	Crusian Federal 2-13	CT-5260	1/15/2010	1.4	0.6	0.0	0.0	0.0	0.0	1.4	0.6	2.1	0.6	NA	consulting with and controlling previously uncontrolled dehydration units and penitentiaries
6/2/2009																	

Year	Month	Day	Event	Location	Time	Duration	Participants	Weather	Notes
2010	Jan	1	New Year's Day	Worldwide	12:00	24h	1	Sunny	New Year's Day
2010	Feb	1	Groundhog Day	Pennsylvania	6:00	1h	1	Cloudy	Groundhog emerged
2010	Mar	1	St. Patrick's Day	Ireland	12:00	24h	1	Windy	St. Patrick's Day
2010	Apr	1	Easter	Jerusalem	6:00	1h	1	Sunny	Easter Sunday
2010	May	1	May Day	London	12:00	24h	1	Cloudy	May Day
2010	Jun	1	Summer Solstice	North Pole	12:00	24h	1	Clear	First day of summer
2010	Jul	1	Bastille Day	France	12:00	24h	1	Sunny	Bastille Day
2010	Aug	1	Lammas	Ireland	12:00	24h	1	Windy	Lammas
2010	Sep	1	Labour Day	Canada	12:00	24h	1	Cloudy	Labour Day
2010	Oct	1	Halloween	USA	12:00	24h	1	Clear	Halloween
2010	Nov	1	Thanksgiving	USA	12:00	24h	1	Sunny	Thanksgiving
2010	Dec	1	Winter Solstice	North Pole	12:00	24h	1	Clear	First day of winter
2010	Dec	25	Christmas	Worldwide	12:00	24h	1	Sunny	Christmas
2010	Dec	31	New Year's Eve	Worldwide	12:00	24h	1	Clear	New Year's Eve
2011	Jan	1	New Year's Day	Worldwide	12:00	24h	1	Sunny	New Year's Day
2011	Feb	1	Groundhog Day	Pennsylvania	6:00	1h	1	Cloudy	Groundhog emerged
2011	Mar	1	St. Patrick's Day	Ireland	12:00	24h	1	Windy	St. Patrick's Day
2011	Apr	1	Easter	Jerusalem	6:00	1h	1	Sunny	Easter Sunday
2011	May	1	May Day	London	12:00	24h	1	Cloudy	May Day
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2011	Jul	1	Bastille Day	France	12:00	24h	1	Sunny	Bastille Day
2011	Aug	1	Lammas	Ireland	12:00	24h	1	Windy	Lammas
2011	Sep	1	Labour Day	Canada	12:00	24h	1	Cloudy	Labour Day
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2011	Dec	25	Christmas	Worldwide	12:00	24h	1	Sunny	Christmas
2011	Dec	31	New Year's Eve	Worldwide	12:00	24h	1	Clear	New Year's Eve
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2012	Feb	1	Groundhog Day	Pennsylvania	6:00	1h	1	Cloudy	Groundhog emerged
2012	Mar	1	St. Patrick's Day	Ireland	12:00	24h	1	Windy	St. Patrick's Day
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2012	Jul	1	Bastille Day	France	12:00	24h	1	Sunny	Bastille Day
2012	Aug	1	Lammas	Ireland	12:00	24h	1	Windy	Lammas
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2012	Nov	1	Thanksgiving	USA	12:00	24h	1	Sunny	Thanksgiving
2012	Dec	1	Winter Solstice	North Pole	12:00	24h	1	Clear	First day of winter
2012	Dec	25	Christmas	Worldwide	12:00	24h	1	Sunny	Christmas
2012	Dec	31	New Year's Eve	Worldwide	12:00	24h	1	Clear	New Year's Eve
2013	Jan	1	New Year's Day	Worldwide	12:00	24h	1	Sunny	New Year's Day
2013	Feb	1	Groundhog Day	Pennsylvania	6:00	1h	1	Cloudy	Groundhog emerged
2013	Mar	1	St. Patrick's Day	Ireland	12:00	24h	1	Windy	St. Patrick's Day
2013	Apr	1	Easter	Jerusalem	6:00	1h	1	Sunny	Easter Sunday
2013	May	1	May Day	London	12:00	24h	1	Cloudy	May Day
2013	Jun	1	Summer Solstice	North Pole	12:00	24h	1	Clear	First day of summer
2013	Jul	1	Bastille Day	France	12:00	24h	1	Sunny	Bastille Day
2013	Aug	1	Lammas	Ireland	12:00	24h	1	Windy	Lammas
2013	Sep	1	Labour Day	Canada	12:00	24h	1	Cloudy	Labour Day
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2013	Dec	31	New Year's Eve	Worldwide	12:00	24h	1	Clear	New Year's Eve
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2020	Dec	31	New Year's Eve	Worldwide	12:00	24h	1	Clear	New Year's Eve
2021	Jan	1	New Year's Day	Worldwide	12:00	24h	1	Sunny	New Year's Day
2021	Feb	1	Groundhog Day	Pennsylvania	6:00	1h	1	Cloudy	Groundhog emerged
2021	Mar	1	St. Patrick's Day	Ireland	12:00	24h	1	Windy	St. Patrick's Day
2021	Apr	1	Easter	Jerusalem	6:00	1h	1	Sunny	Easter Sunday
2021	May	1	May Day	London	12:00	24h	1	Cloudy	May Day
2021	Jun	1	Summer Solstice	North Pole	12:00	24h	1	Clear	First day of summer
2021	Jul	1	Bastille Day						

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